INTERIM LEGISLATIVE COMMITTEE ON NATURAL RESOURCES

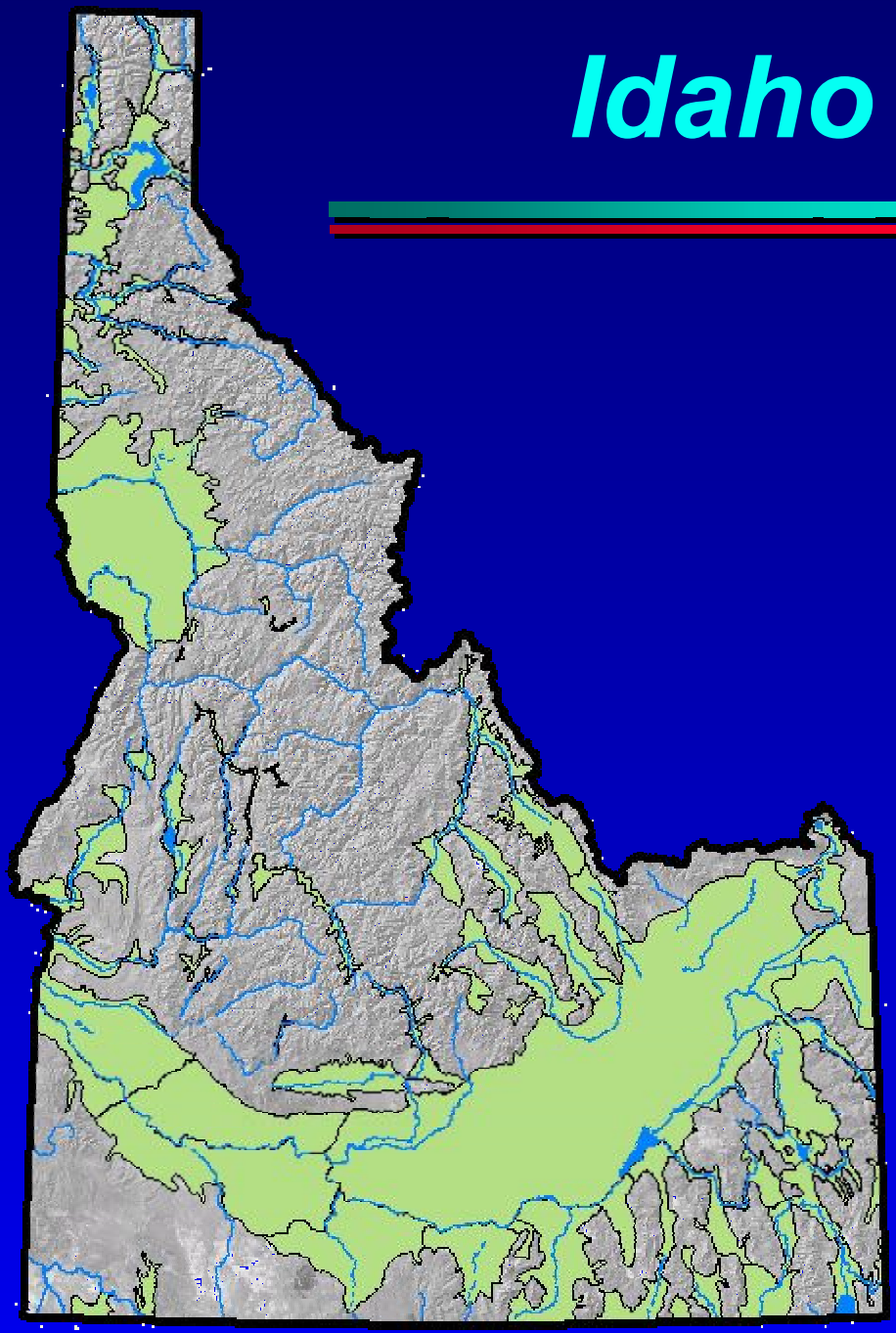
Historical Perspectives and Current Status Of Various Aquifer Systems in Idaho

Karl J. Dreher

Director
Idaho Department of Water Resources

April 9, 2004

Idaho Aquifers



Definitions

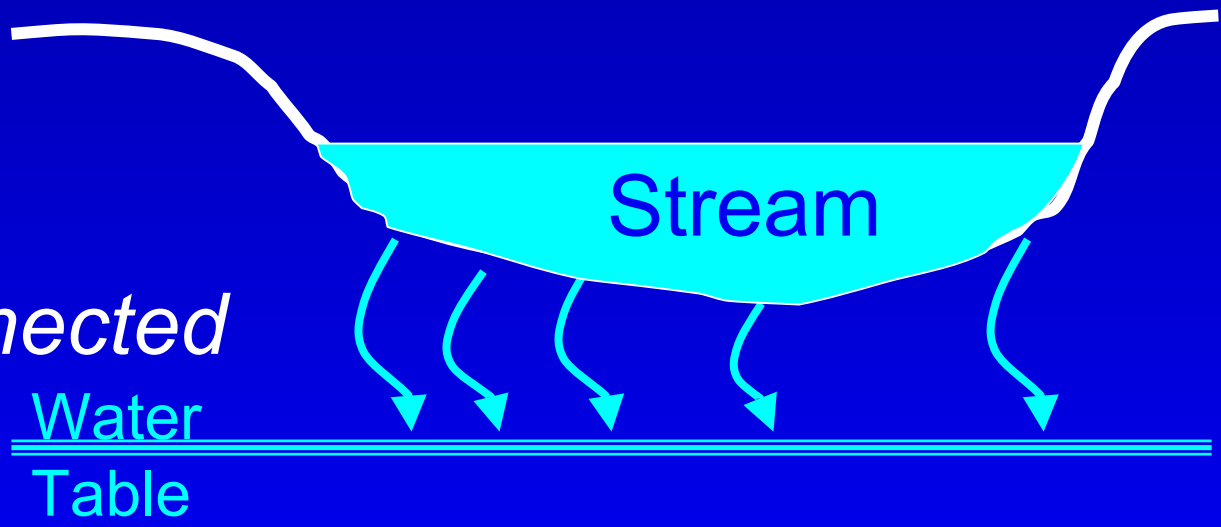
"Hydraulically connected" surface water and ground water means:

- **Within these sources, a portion of the surface water can become ground water or vice versa.**

Surface Water Ground Water Connection

YES

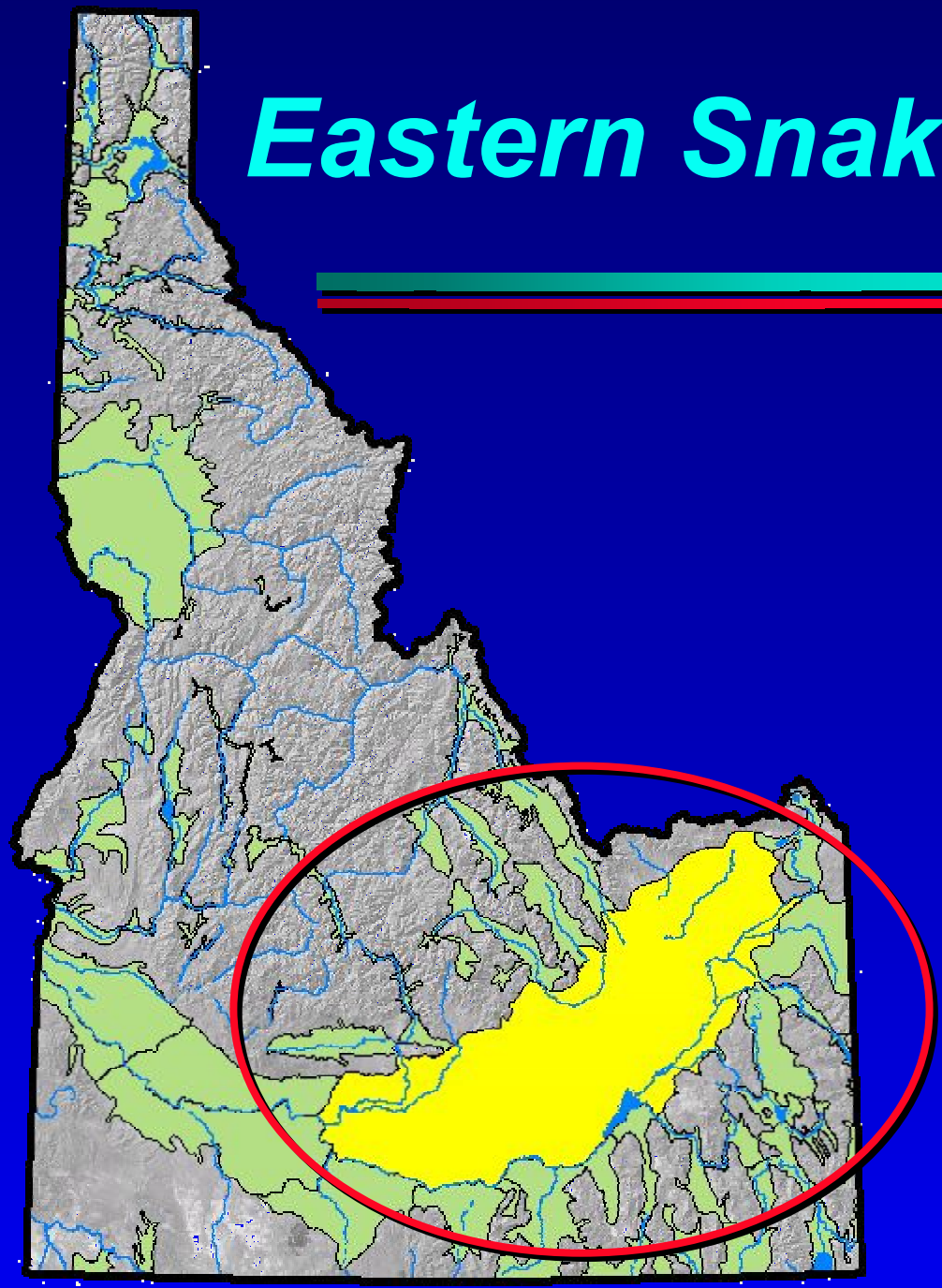
Connected

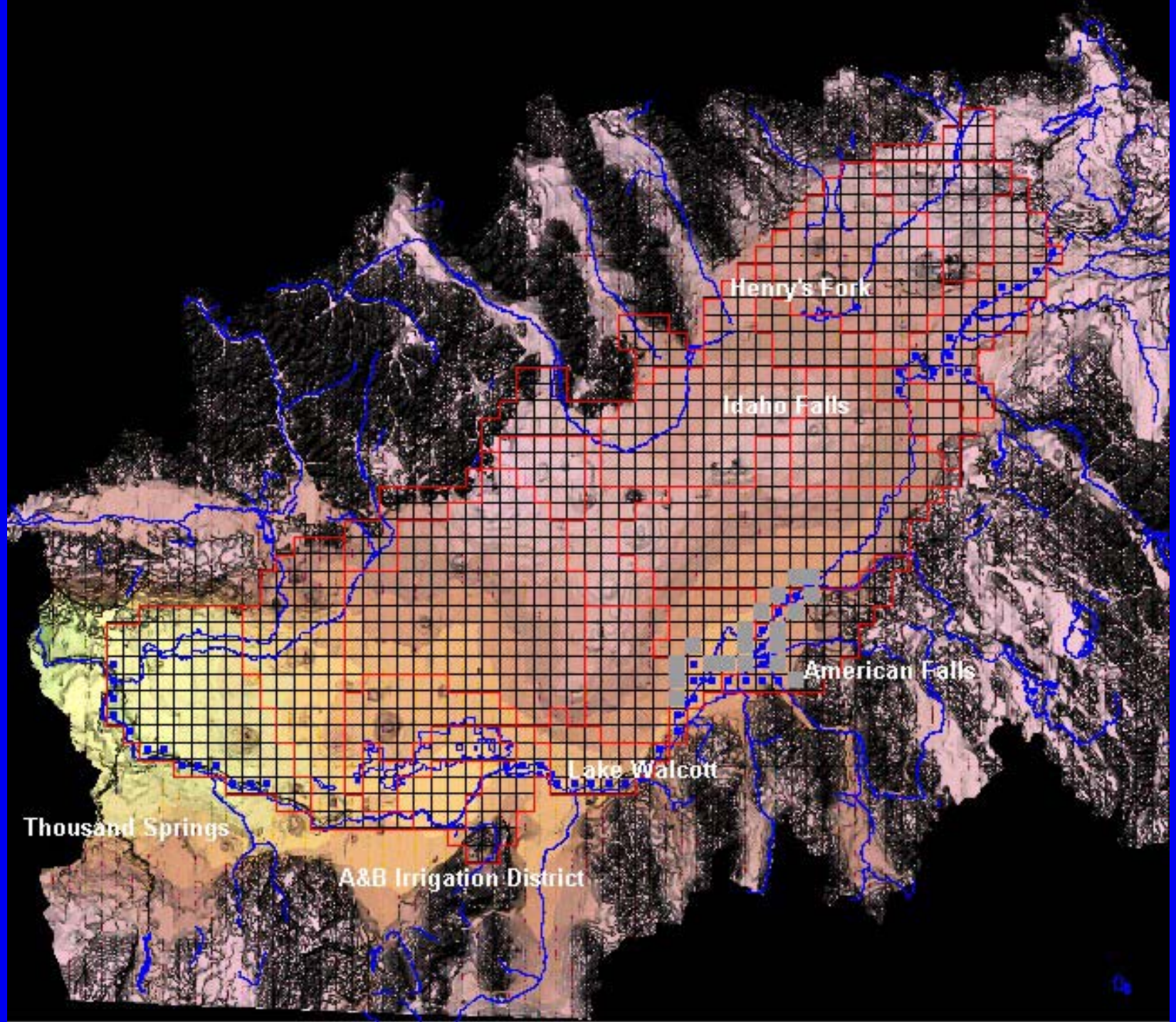


NO

Disconnected

Eastern Snake River Plain

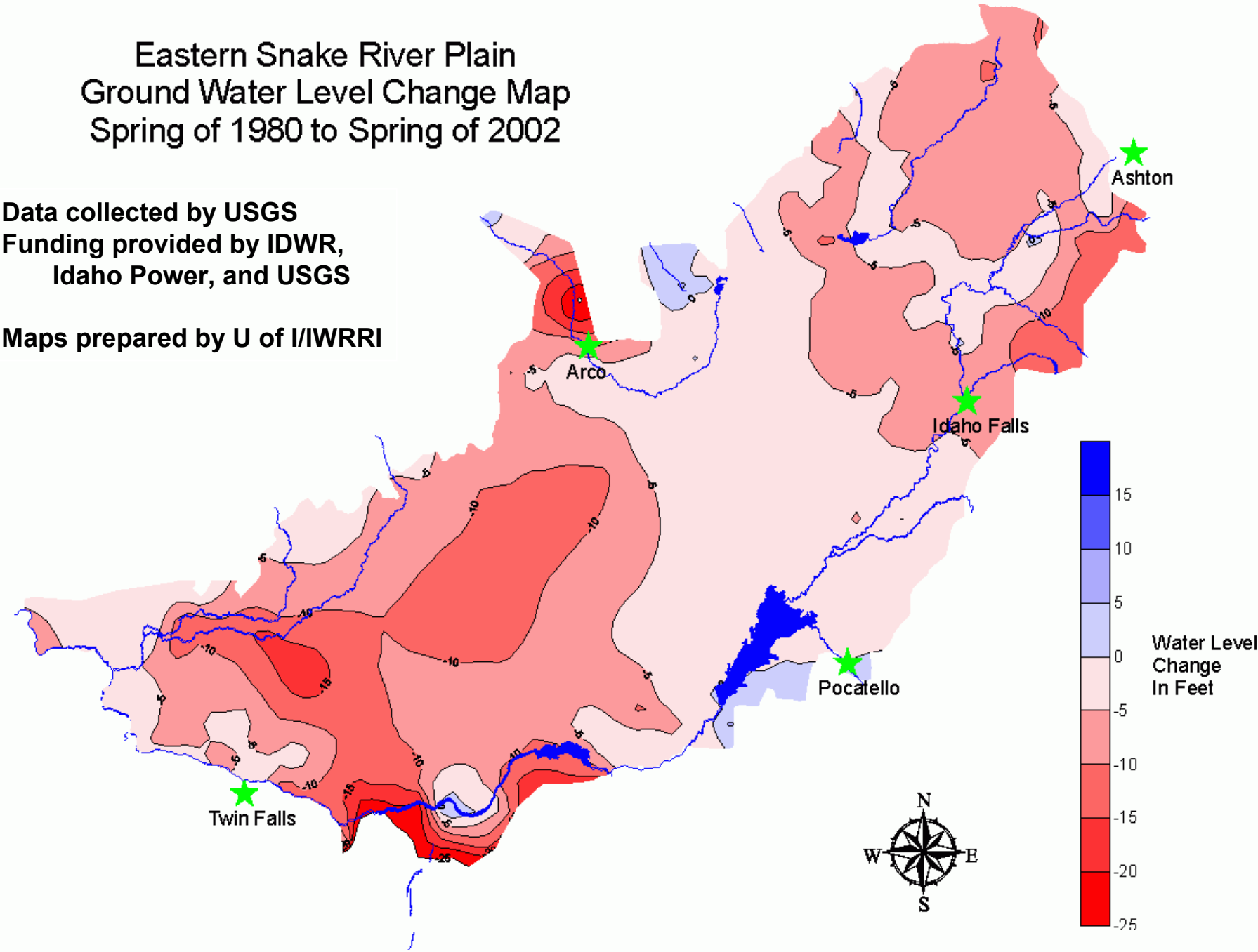



Henry's Fork
Idaho Falls
American Falls
Lake Walcott
Thousand Springs
A&B Irrigation District

Eastern Snake River Plain
Ground Water Level Change Map
Spring of 1980 to Spring of 2002

Data collected by USGS
Funding provided by IDWR,
Idaho Power, and USGS

Maps prepared by U of I/IWRRI



Eastern Snake River Plain
Ground Water Level Change Map
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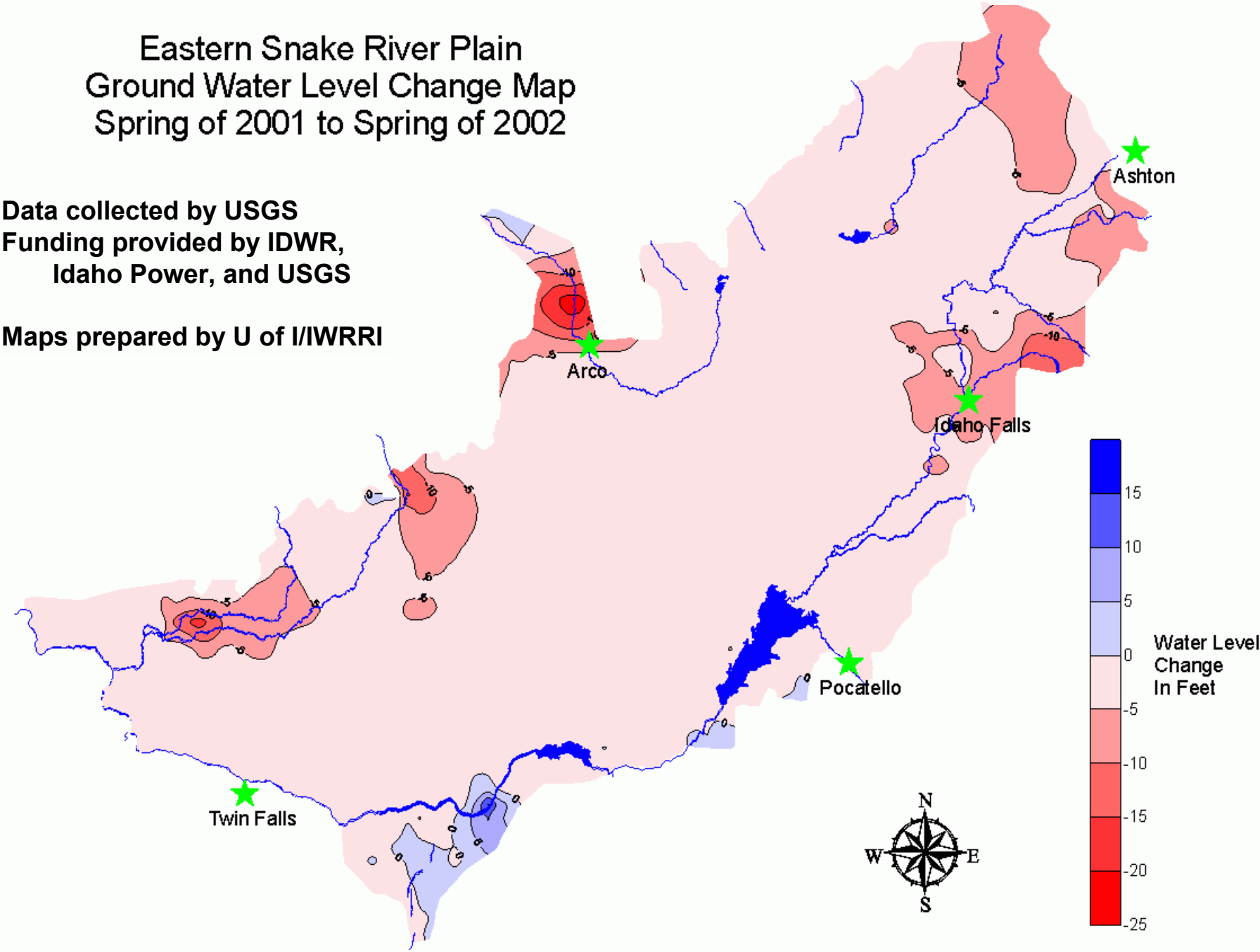
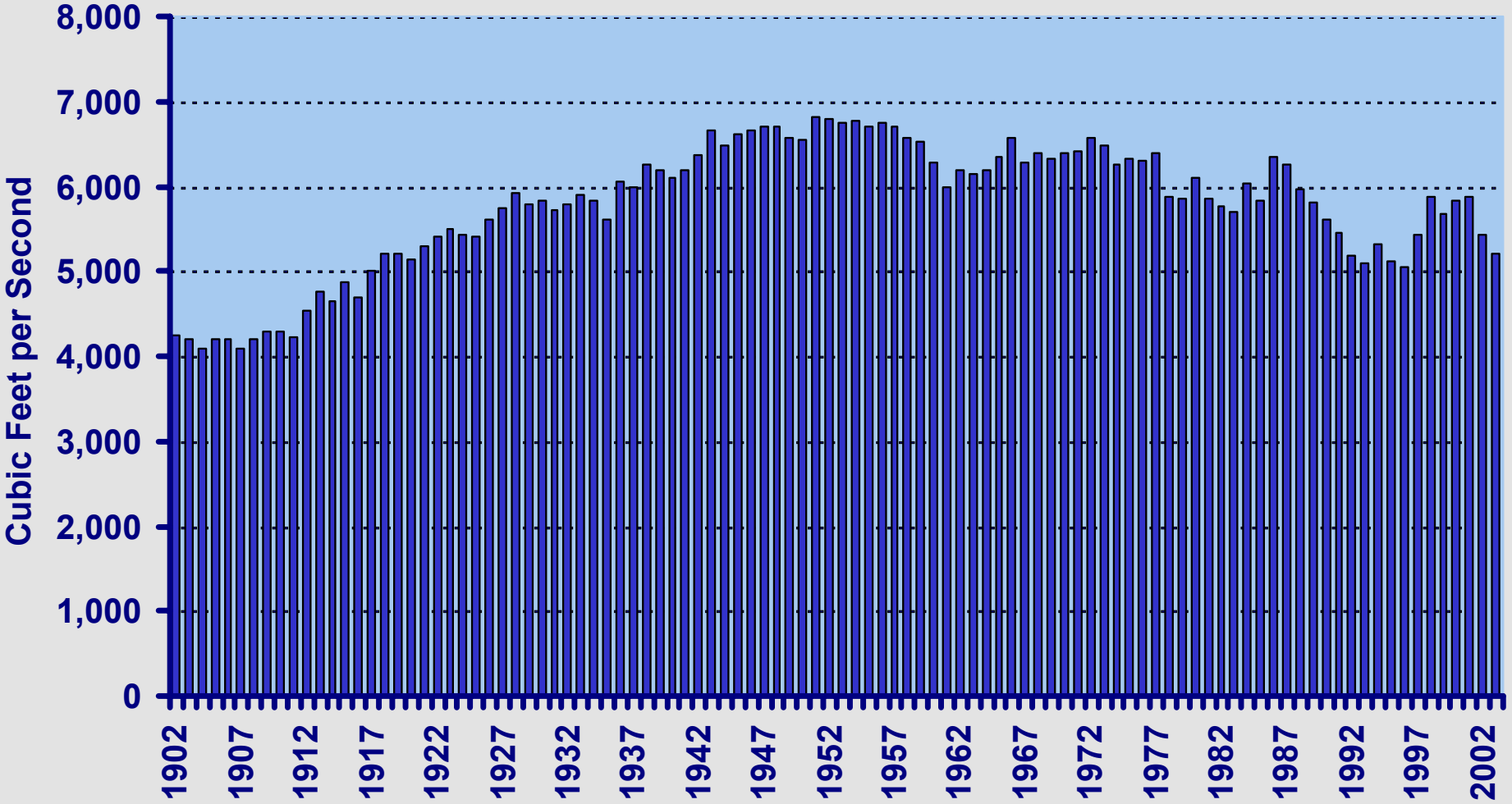


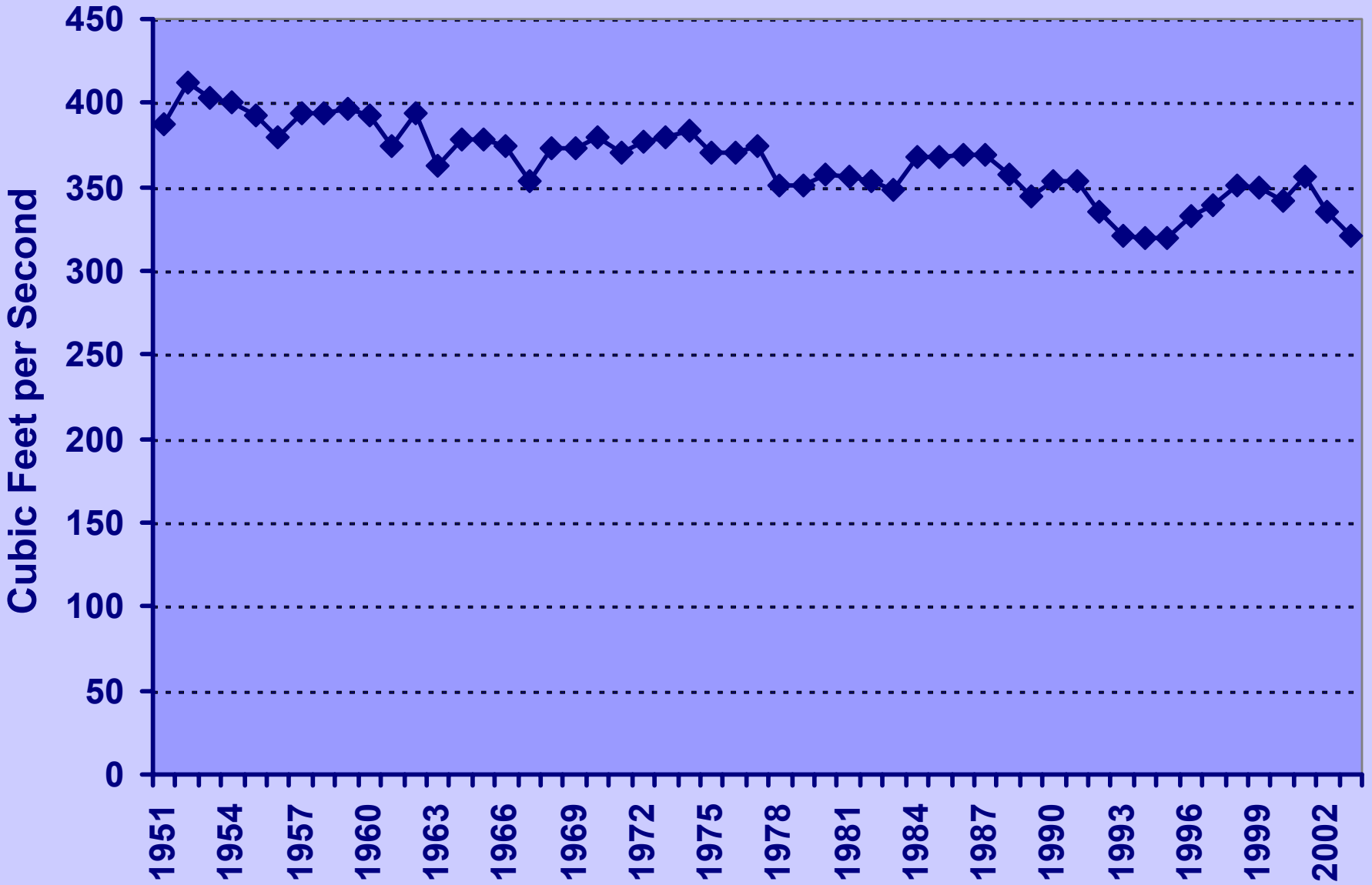
AVERAGE ANNUAL SPRING DISCHARGE TO SNAKE RIVER BETWEEN MILNER AND KING HILL

1902-2003



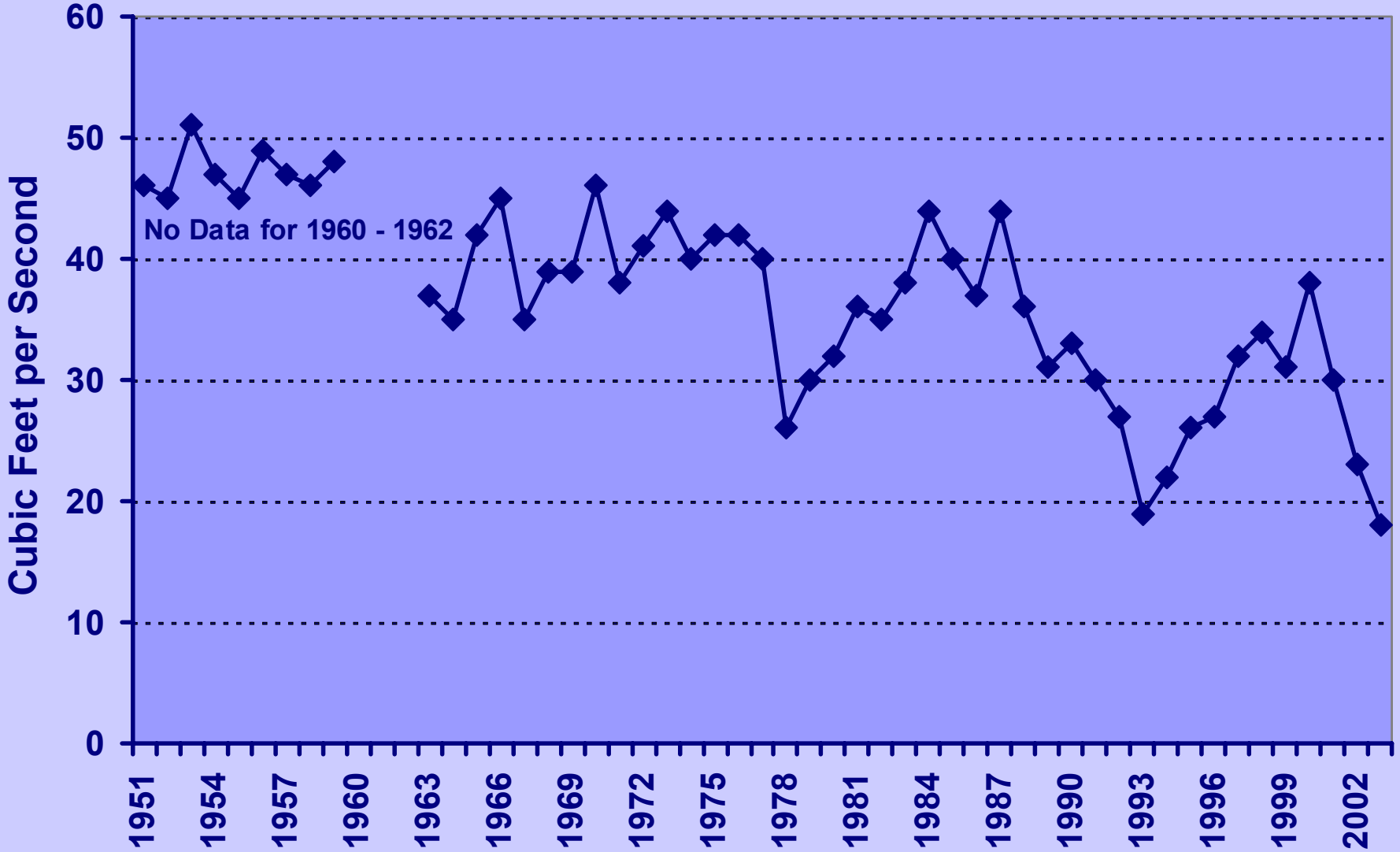
DISCHARGE FROM BOX CANYON SPRING

1951-2003



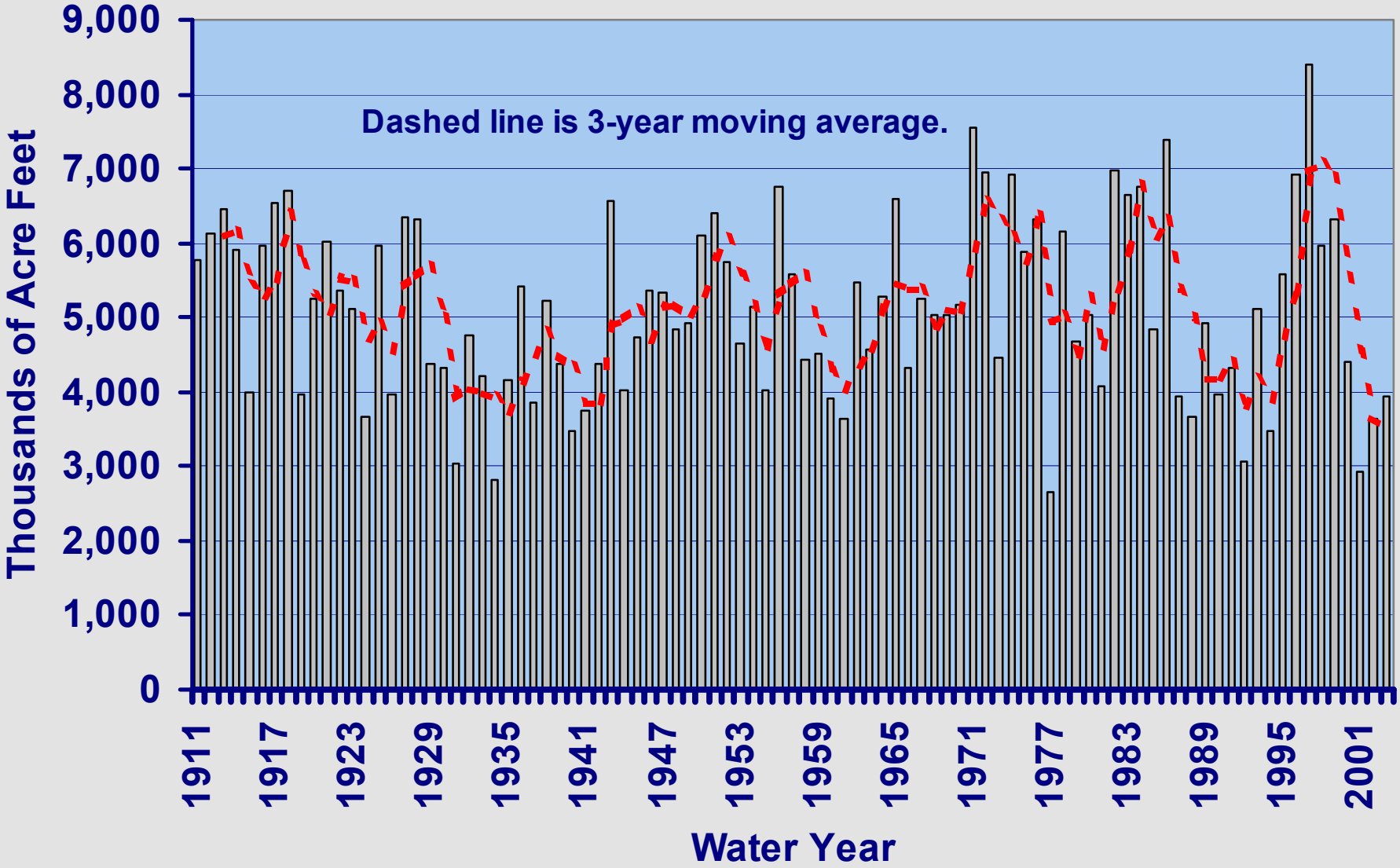
CUMULATIVE SPRING DISCHARGE AT HEAD OF BILLINGSLEY CREEK

1951 - 2003

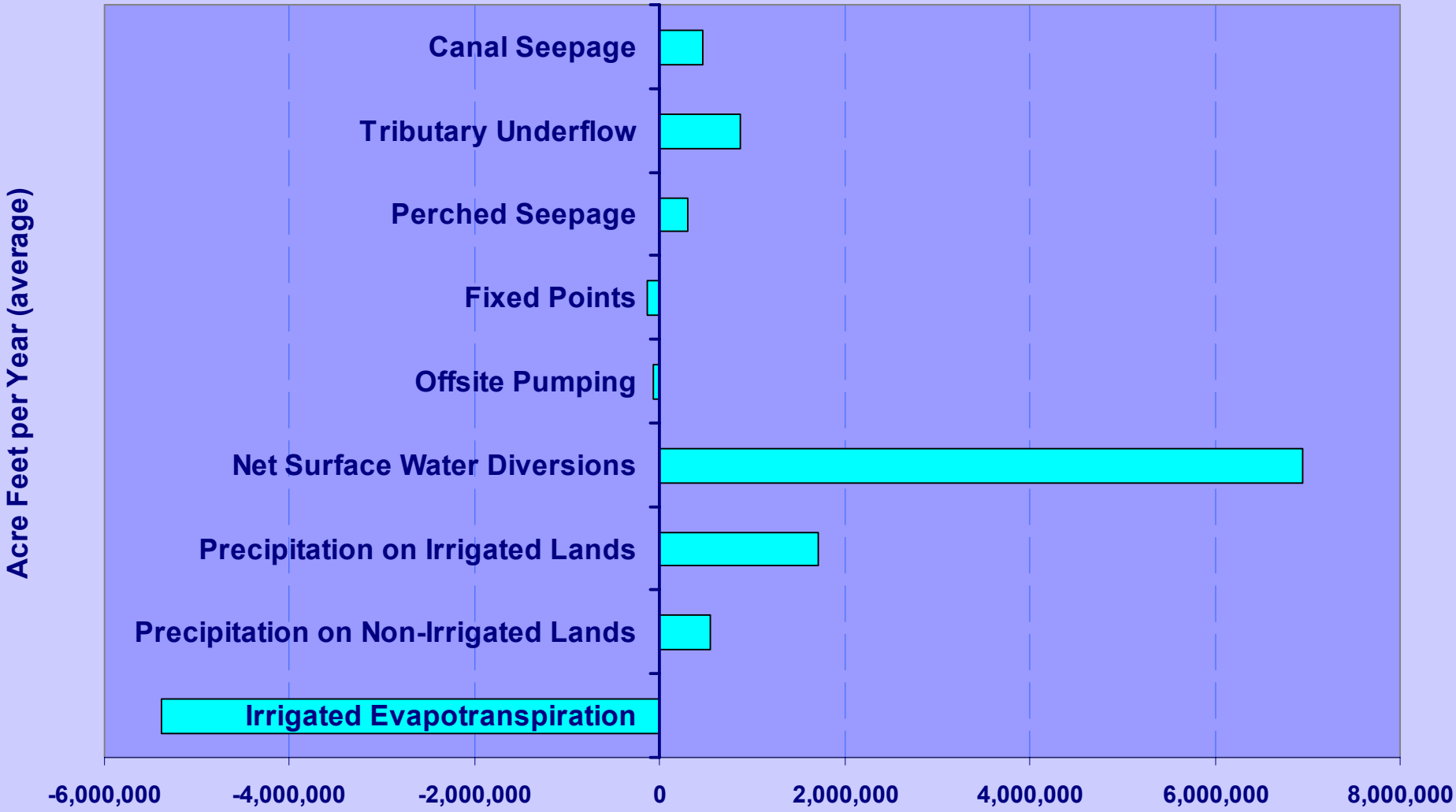


SNAKE RIVER NEAR HEISE
NATURAL FLOW

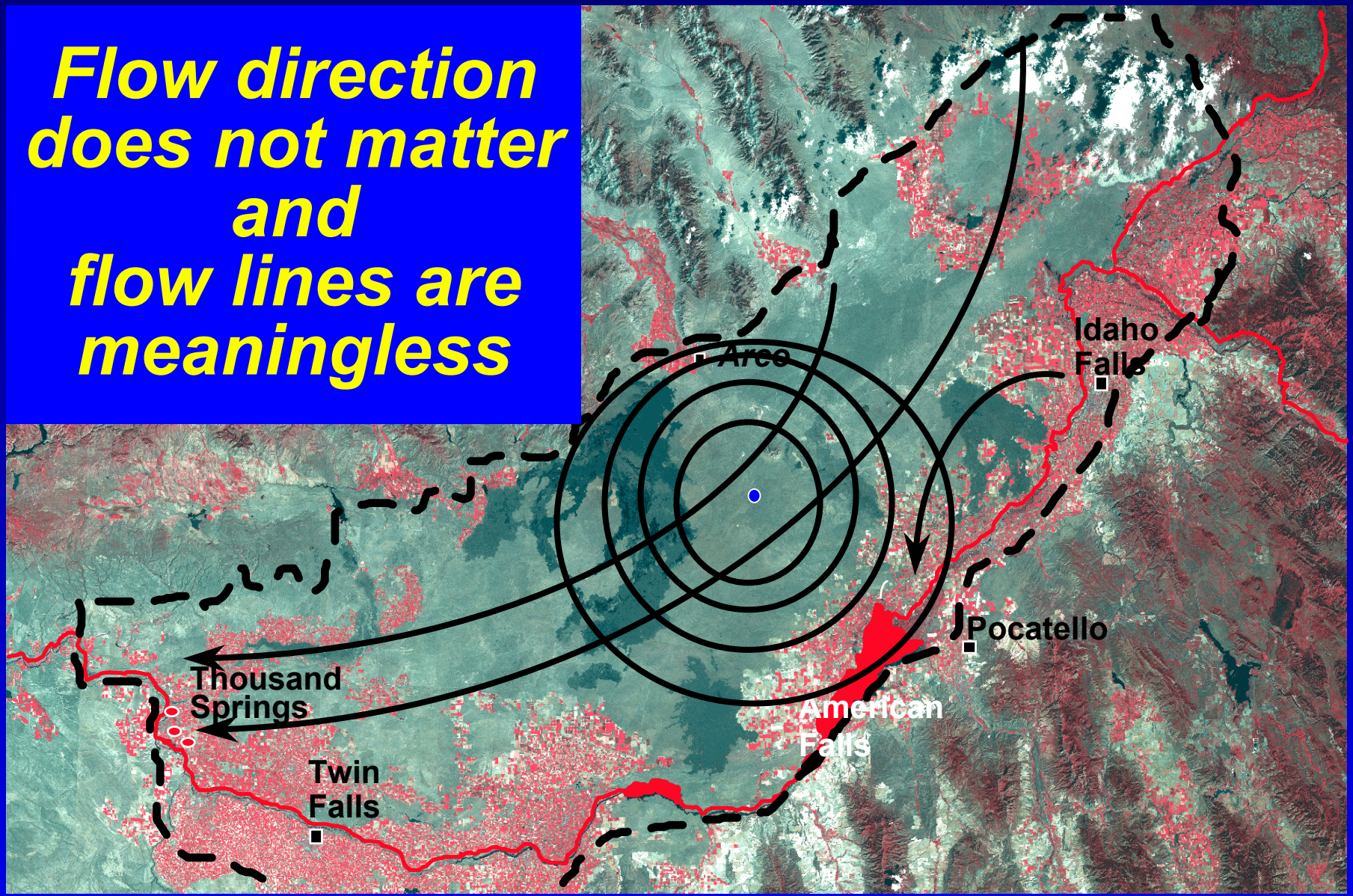
1911-2003



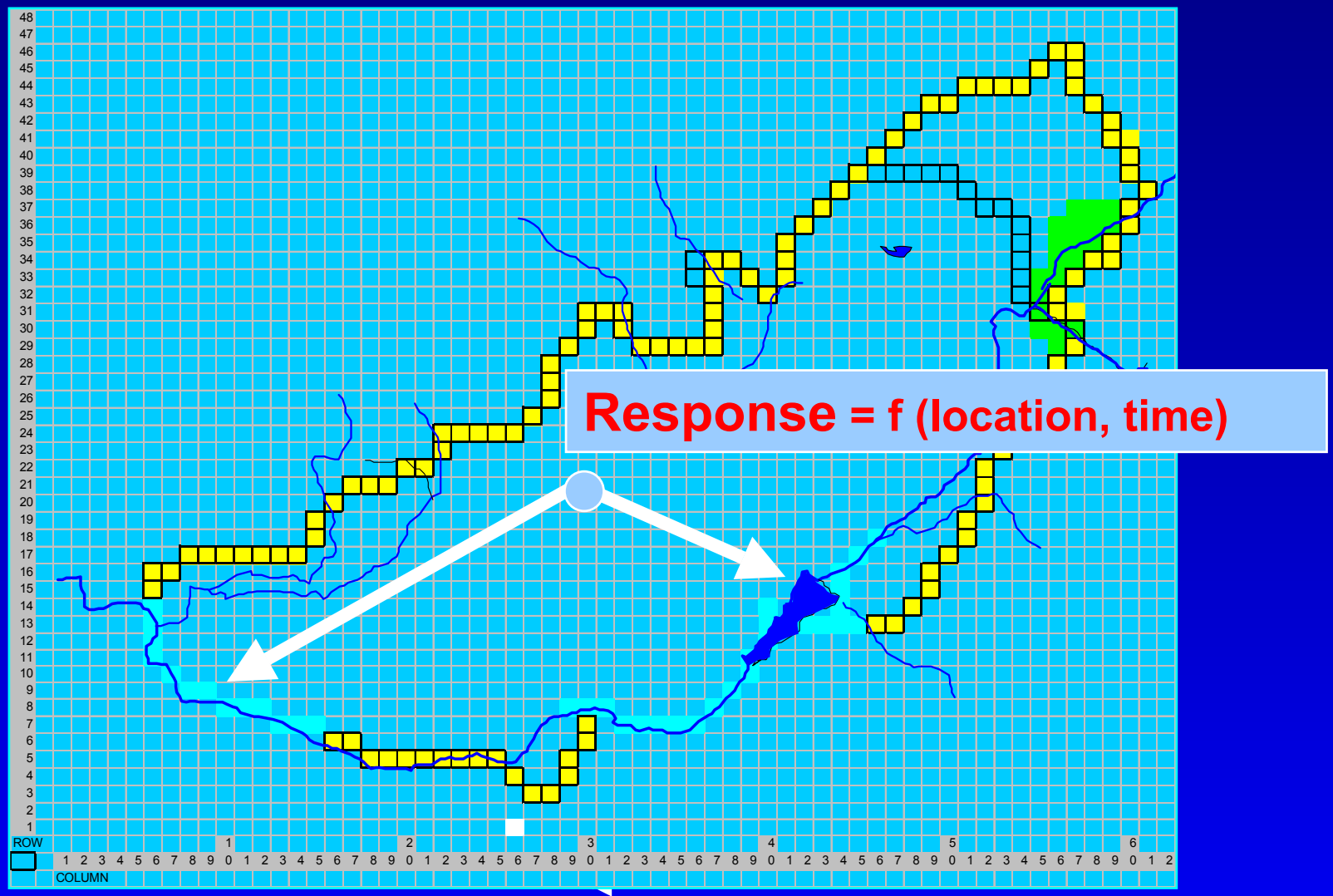
Water Budget for Eastern Snake Plain Aquifer



Flow direction does not matter and flow lines are meaningless



Effects of Ground Water Withdrawals



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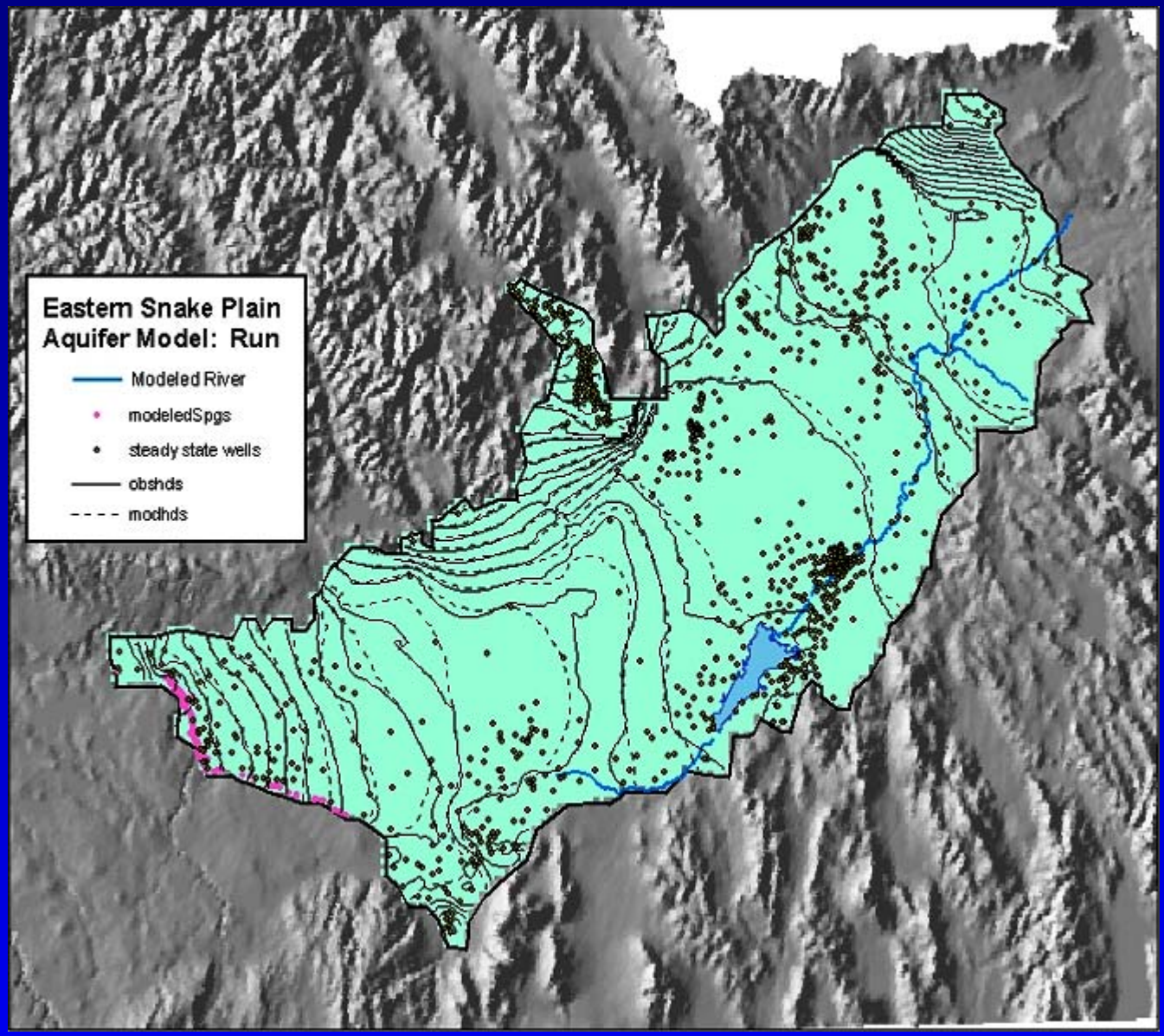
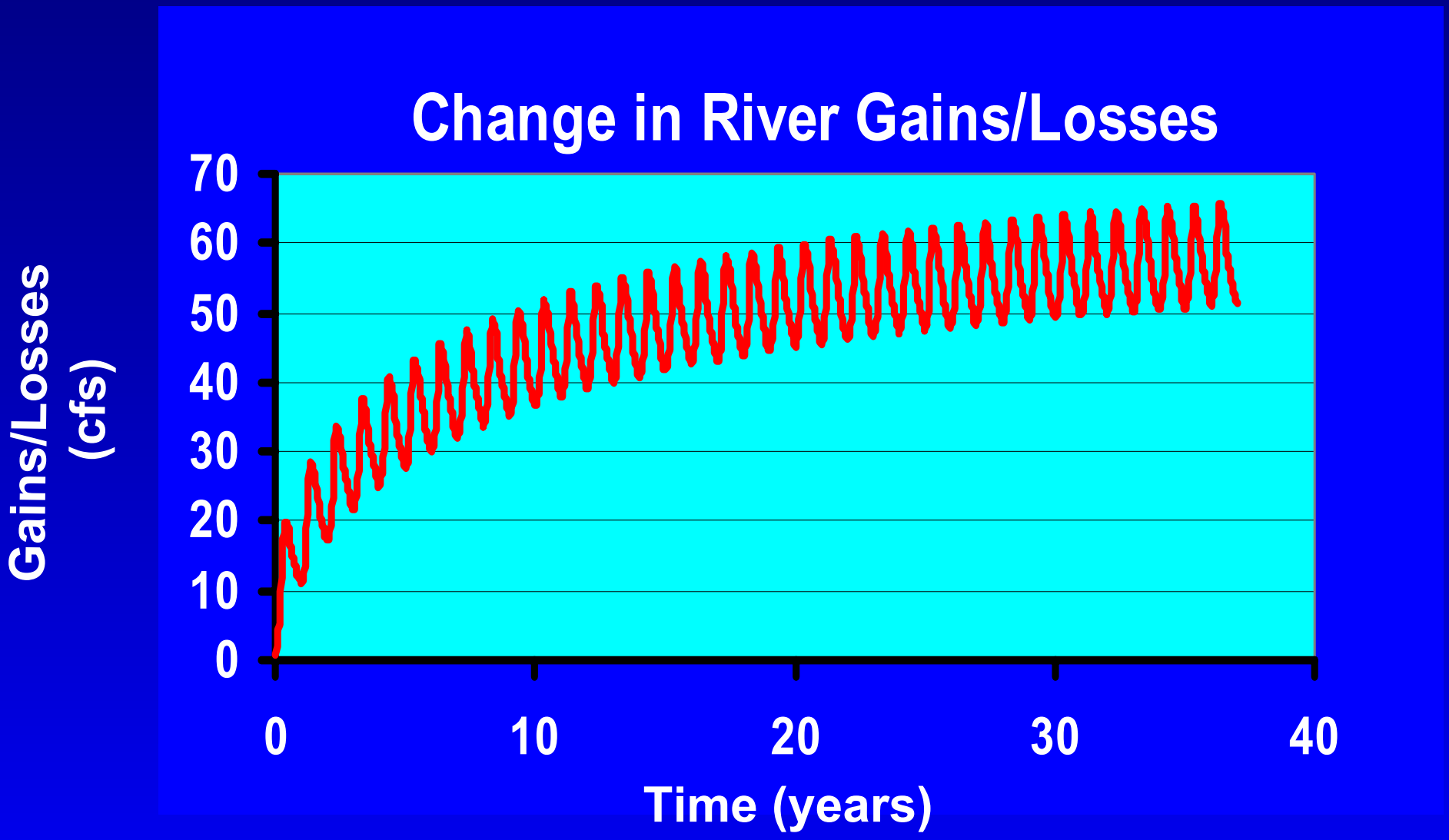
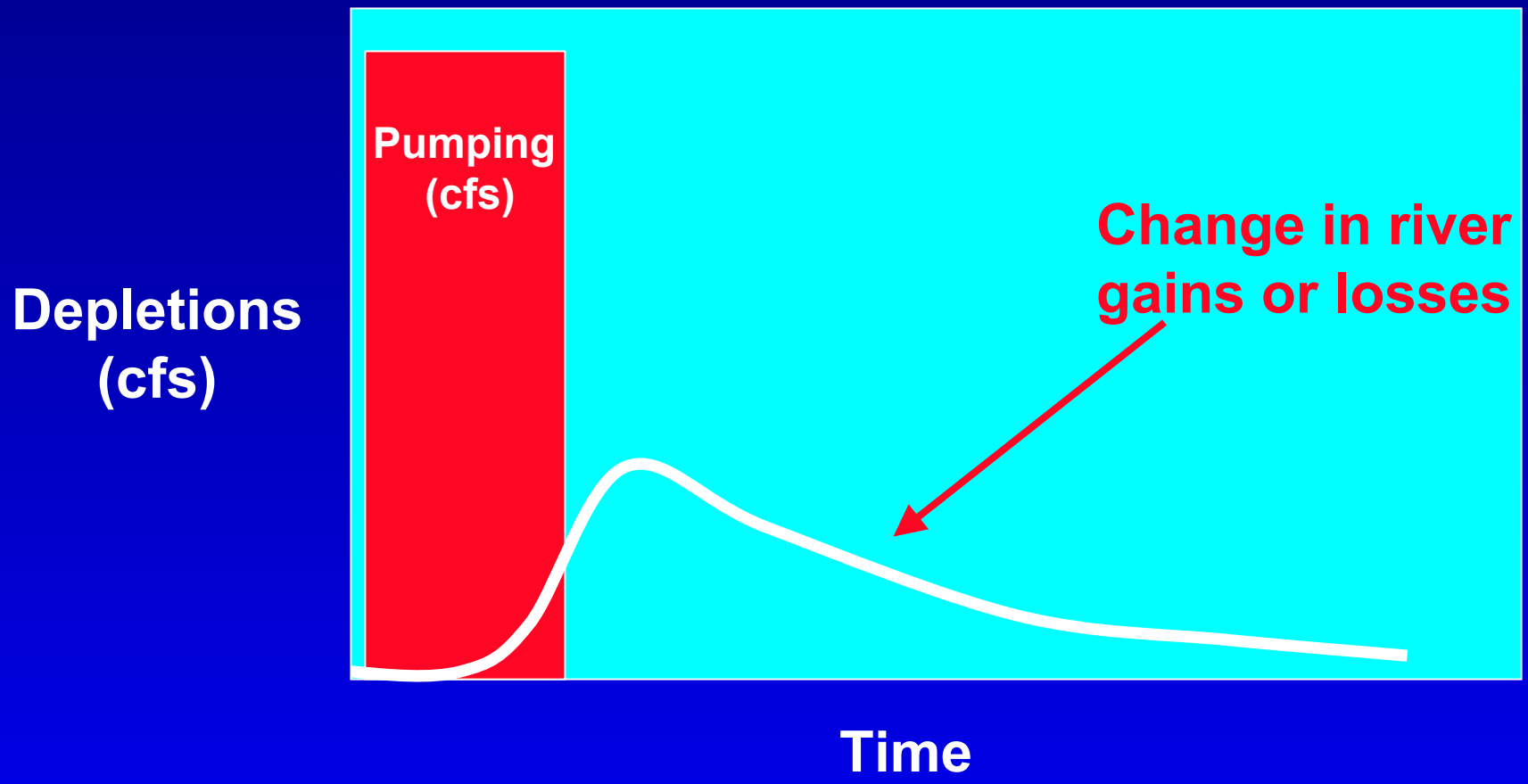


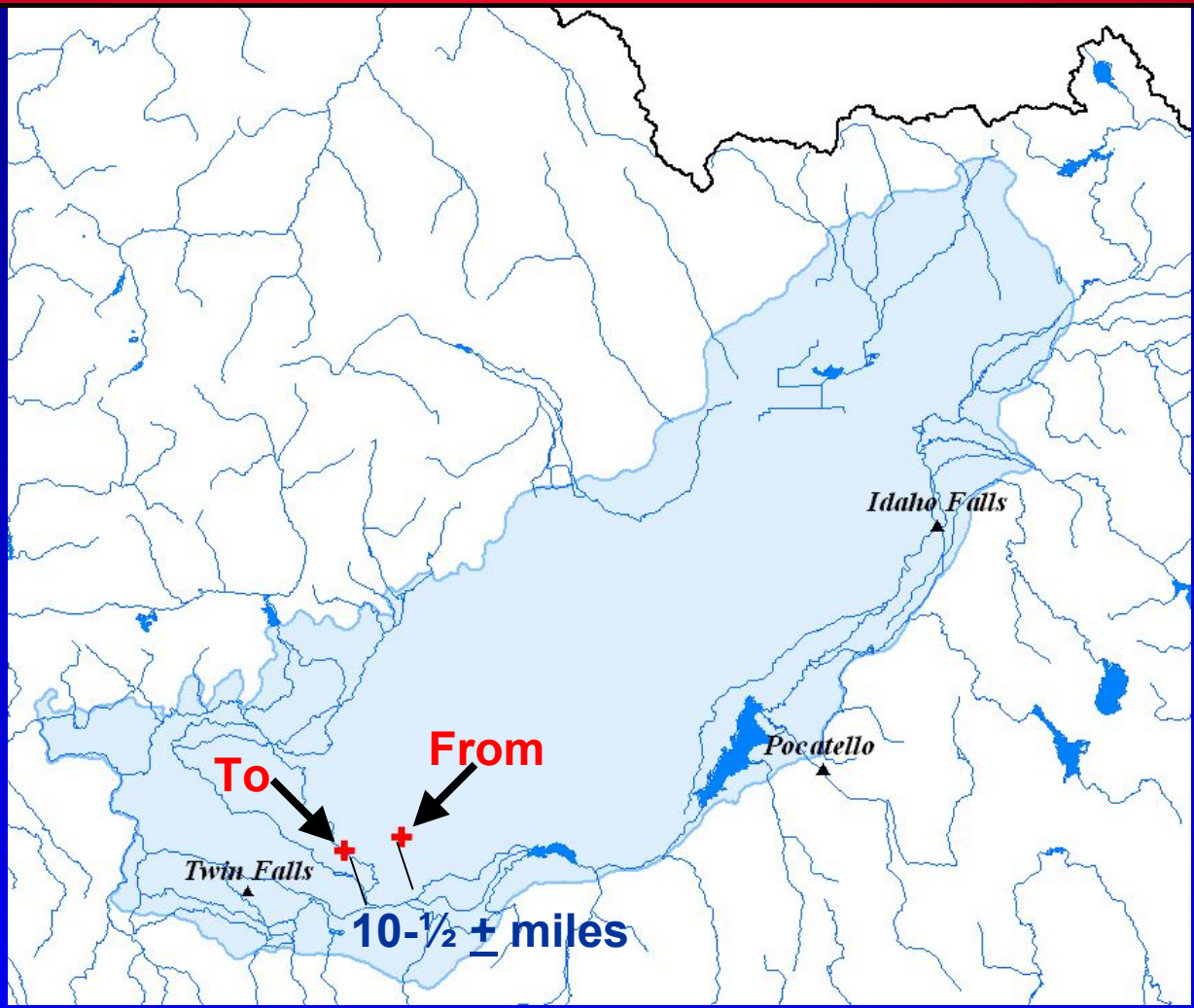
Effects of Ground Water Withdrawals (Depletions)



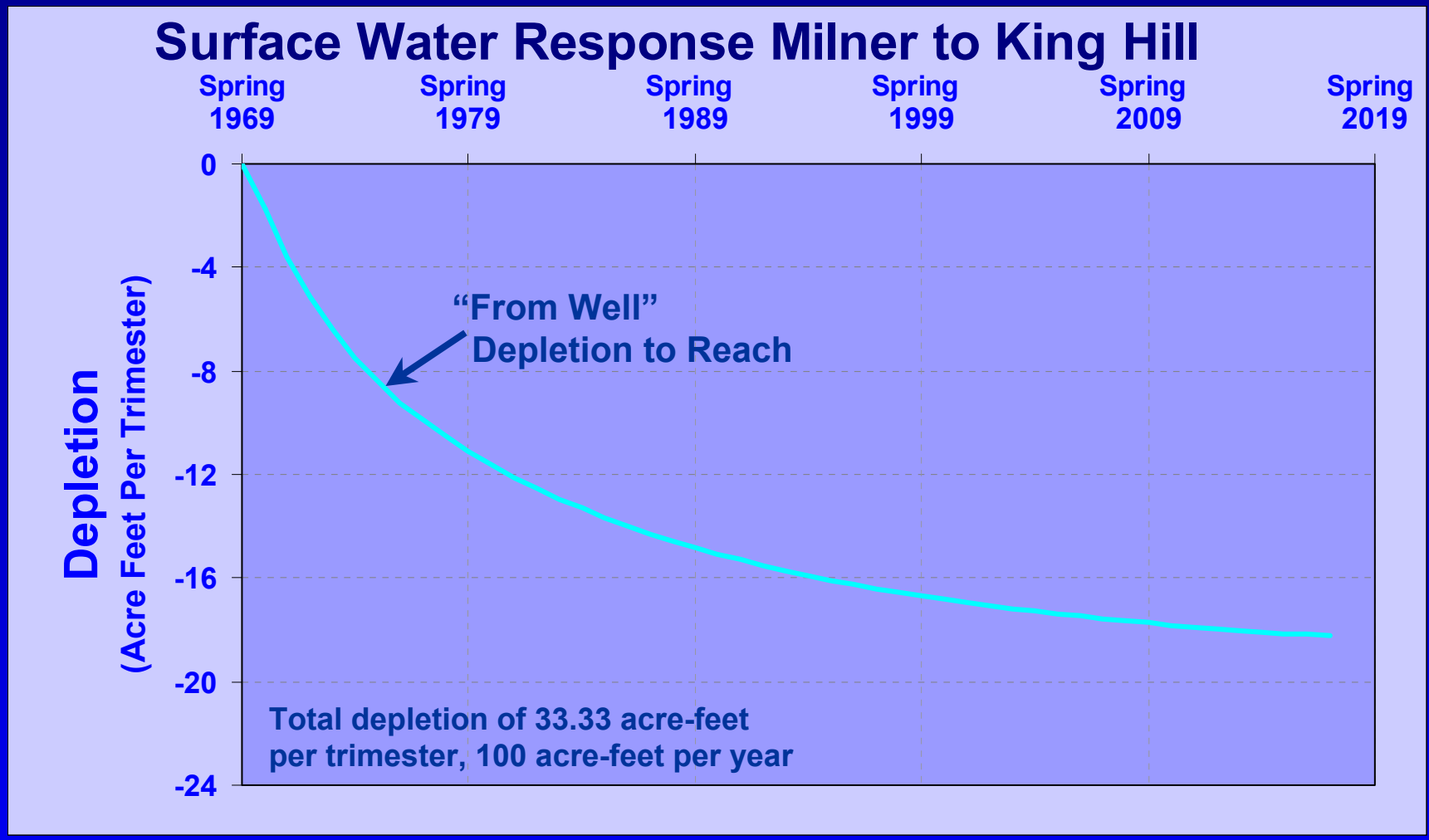
Time Lag and Attenuation



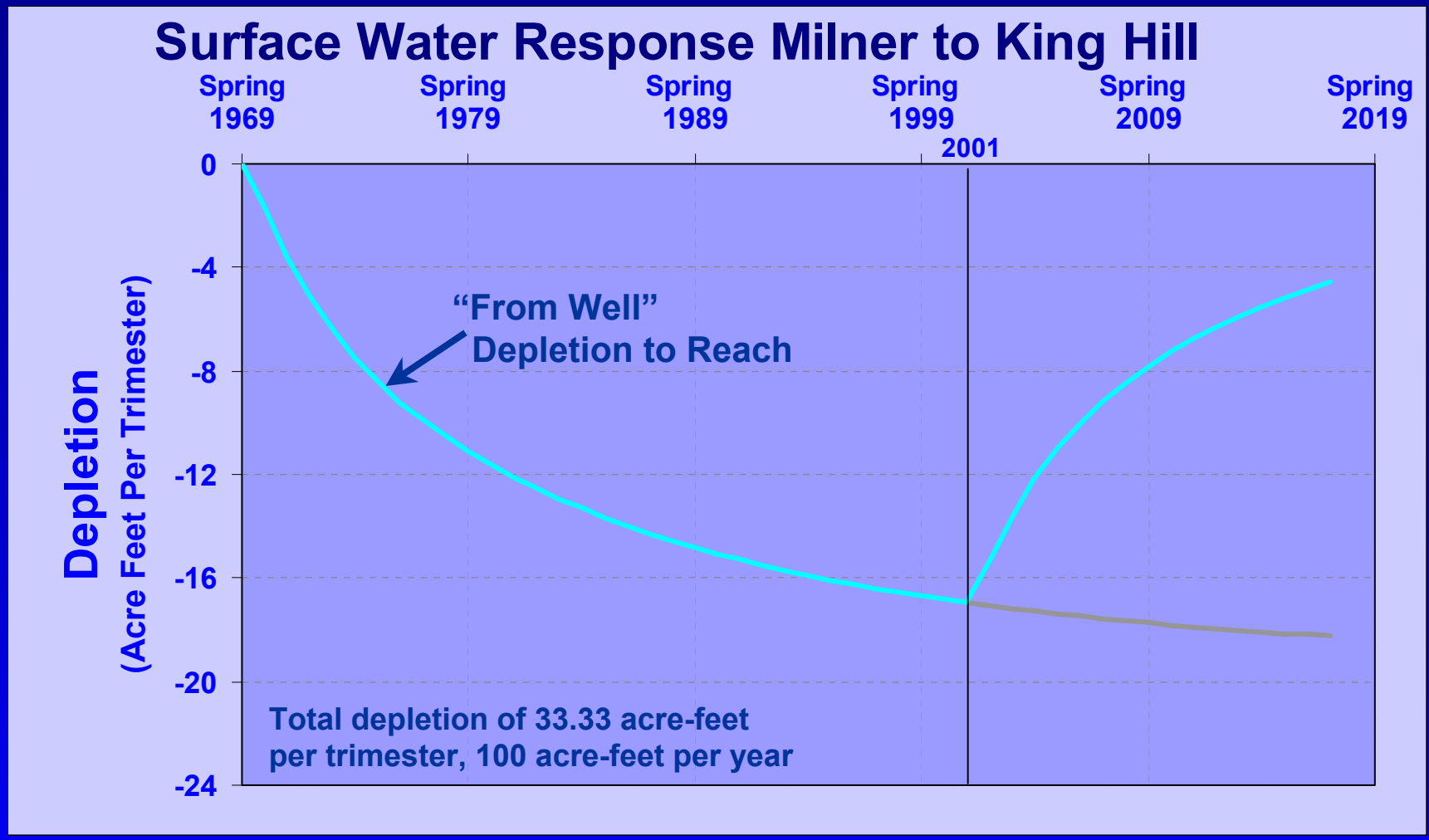
Transfers of Ground Water Rights



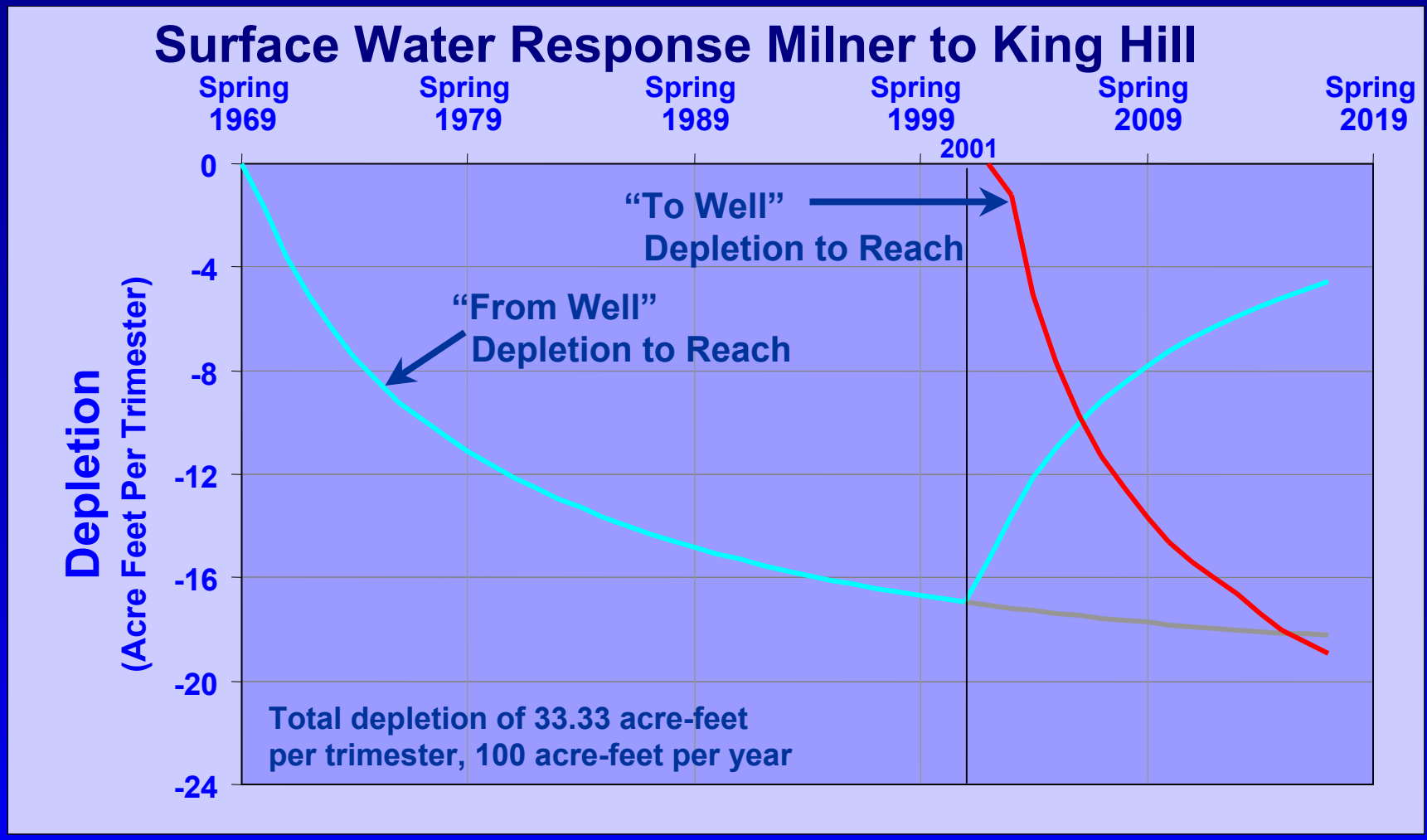
Depletion Effects From Original Well



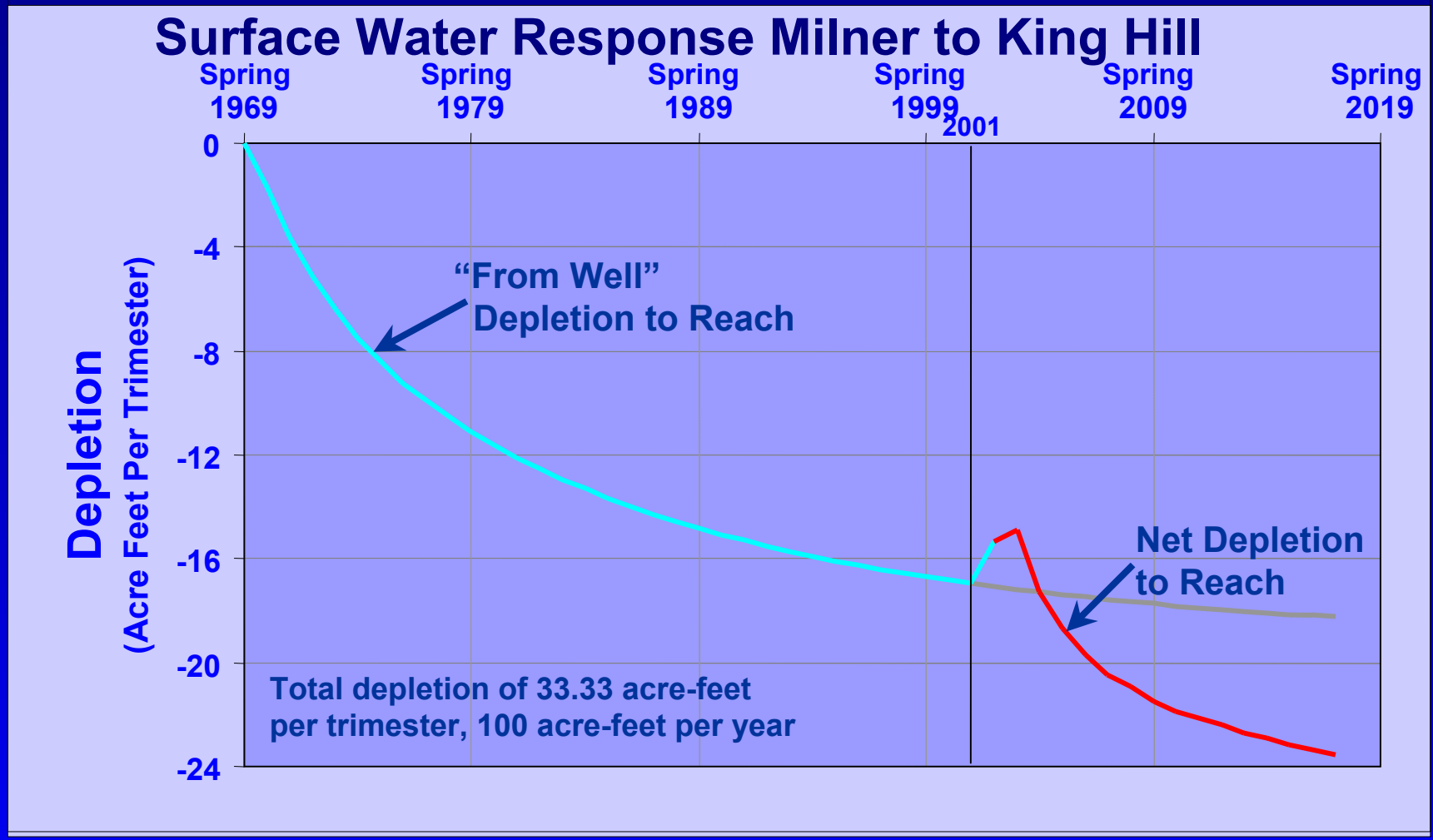
Depletion Effects From Original Well



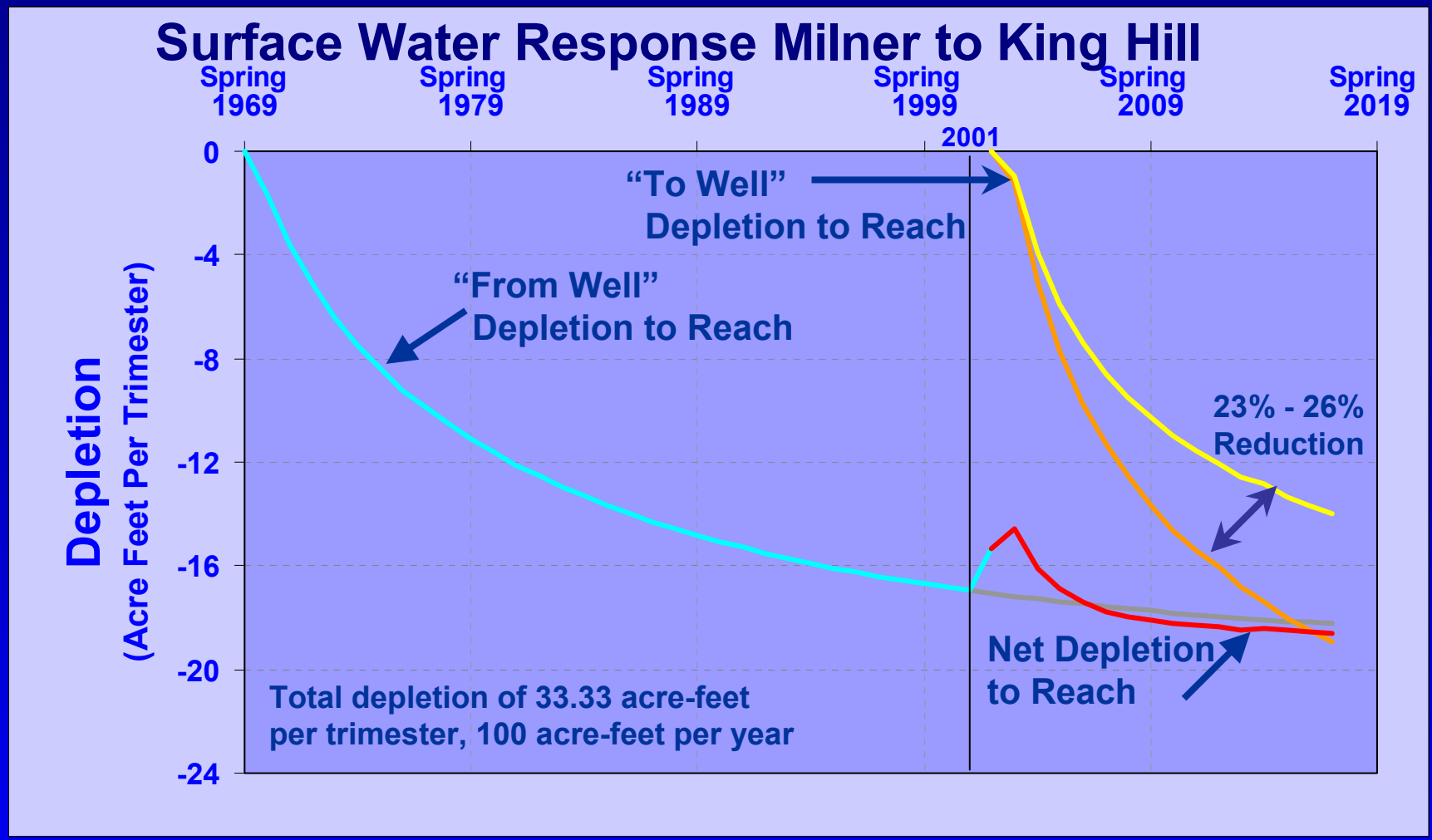
Depletion Effects From Original & New Wells



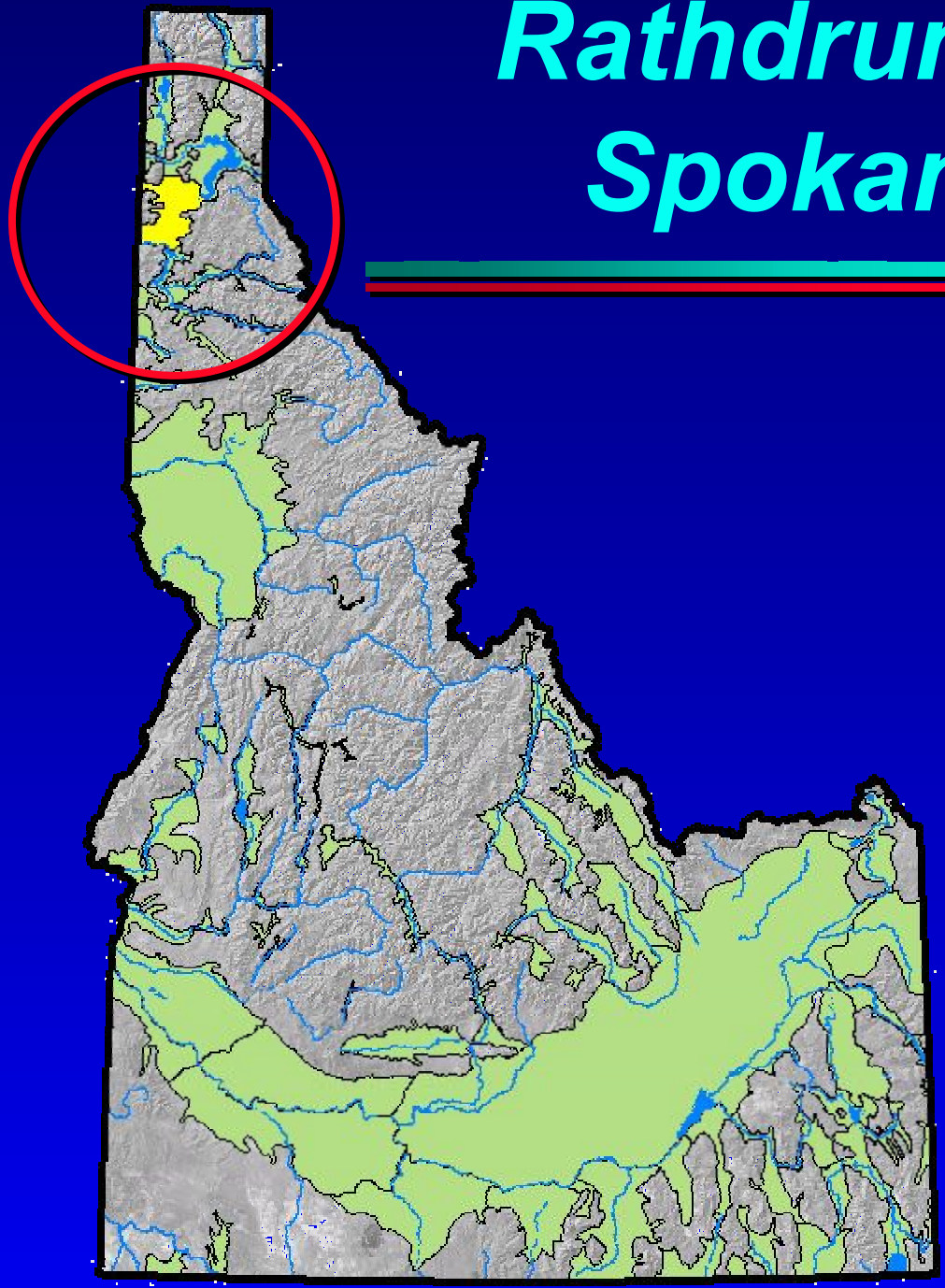
Depletion Effects From Original & New Wells



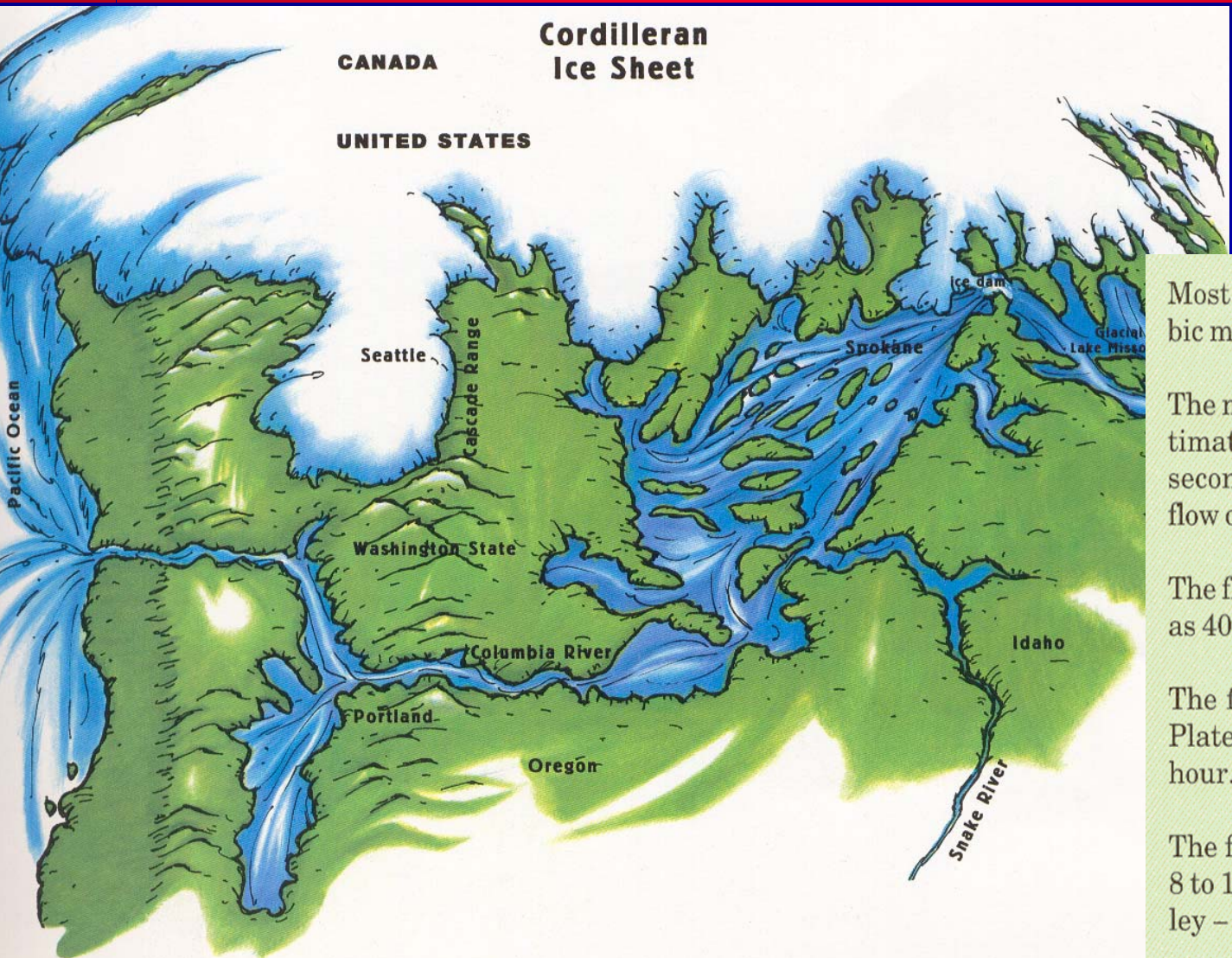
Maintaining Status Quo To Prevent Injury



Rathdrum Prairie – Spokane Valley



Pacific Northwest During Last Ice Age (12,000 to 15,000 Years Ago)



Most of Lake Missoula, about 500 cubic miles, drained in a few days.

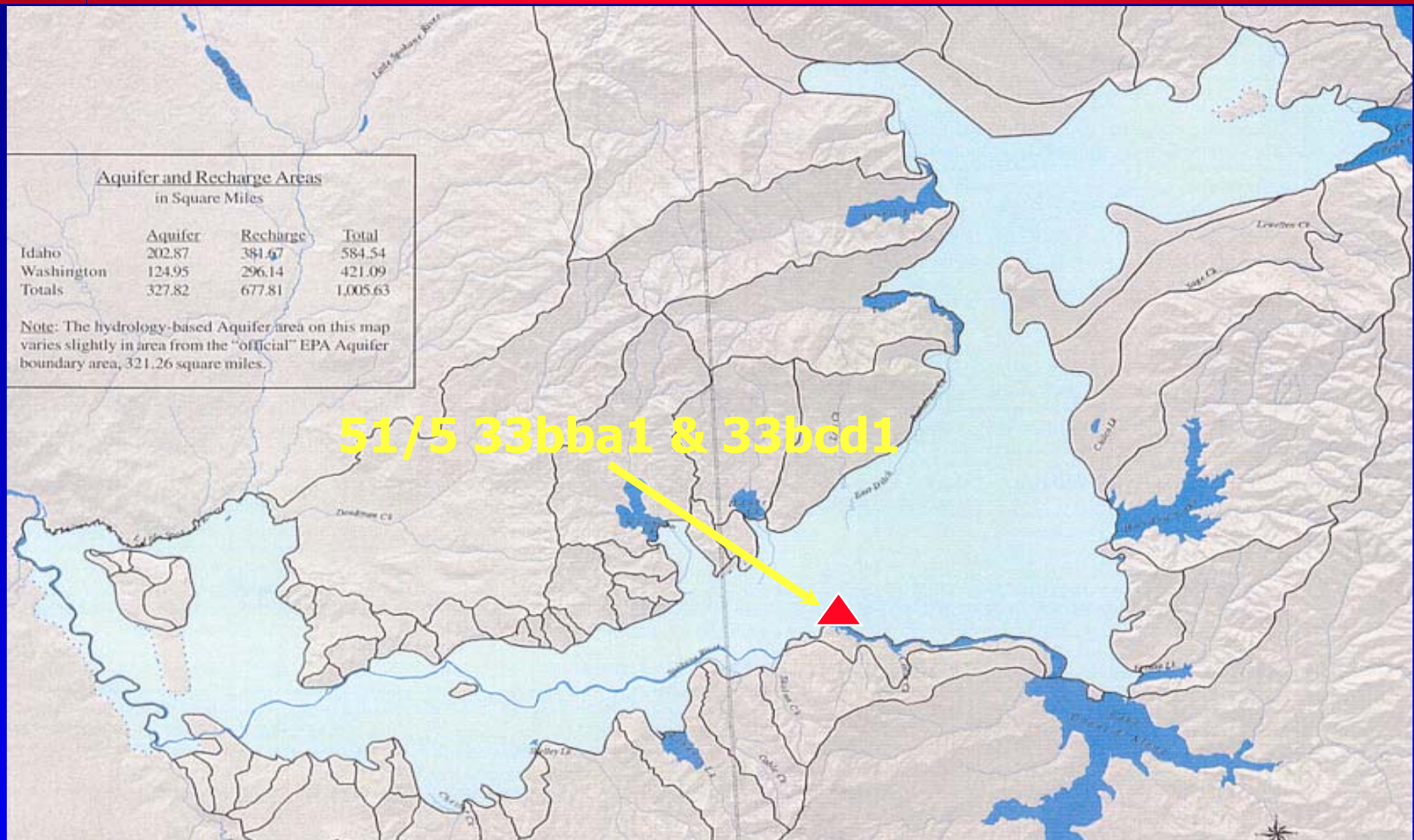
The maximum flood discharge was estimated as 750 million cubic feet per second, twenty times the combined flow of all the rivers in the world today.

The floods may have occurred as many as 40 times.

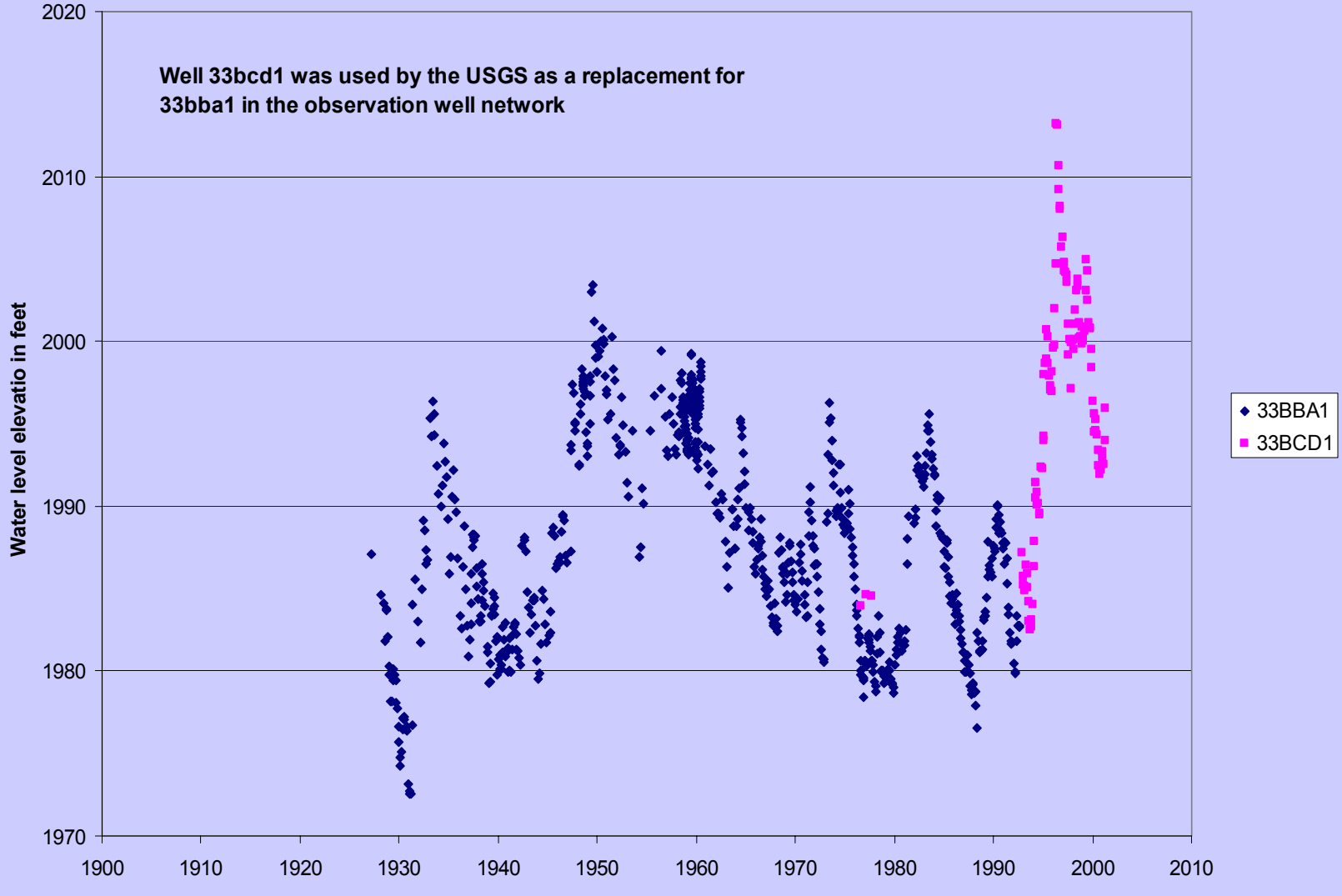
The flood velocity over the Columbia Plateau is estimated at 45 miles per hour.

The flood carried boulders as large as 8 to 10 feet across to the Spokane Valley – Rathdrum Prairie region.

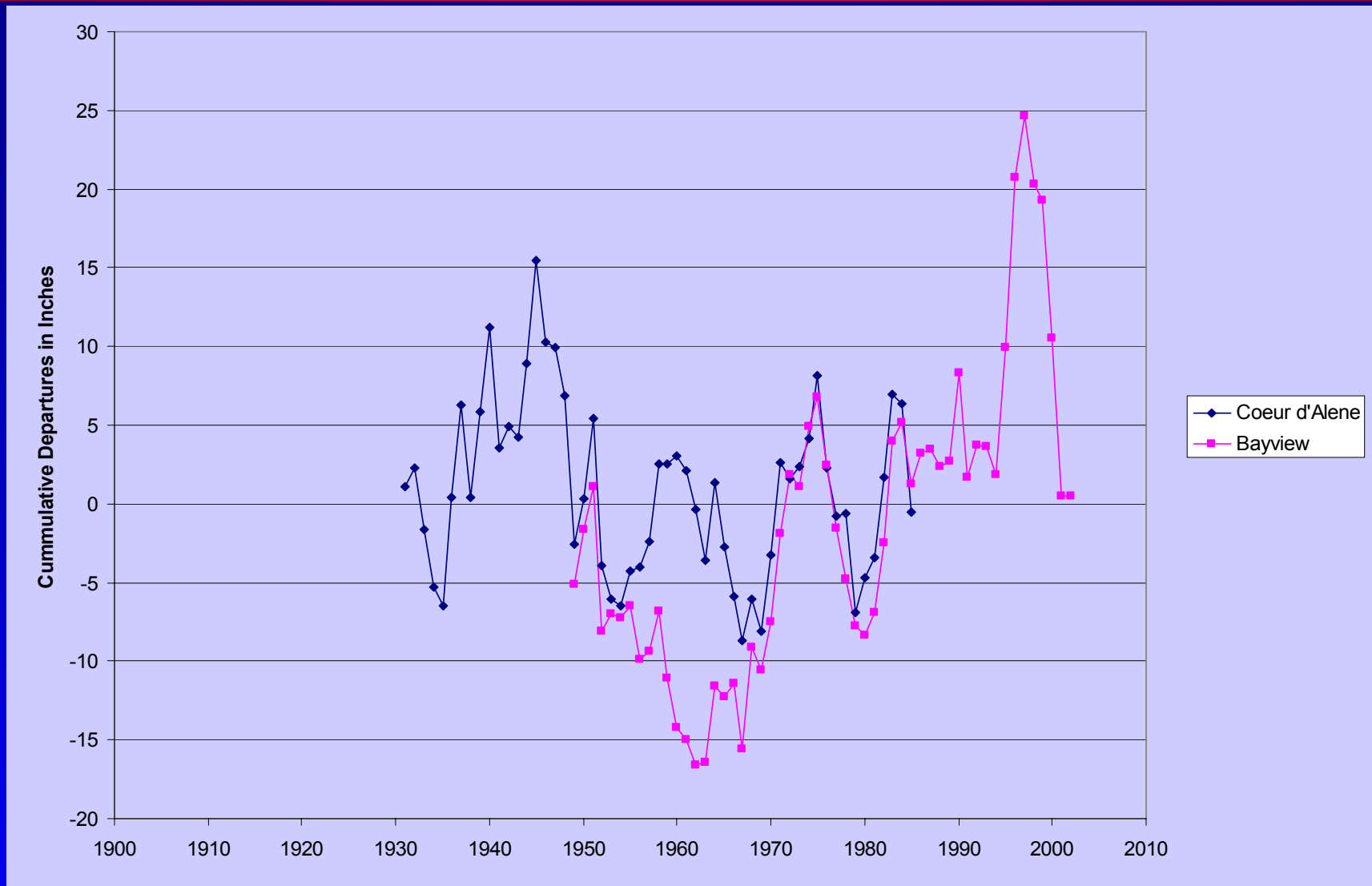
Sample Long-Term Observation Well



Water Levels in Sample Long-Term Observation Well



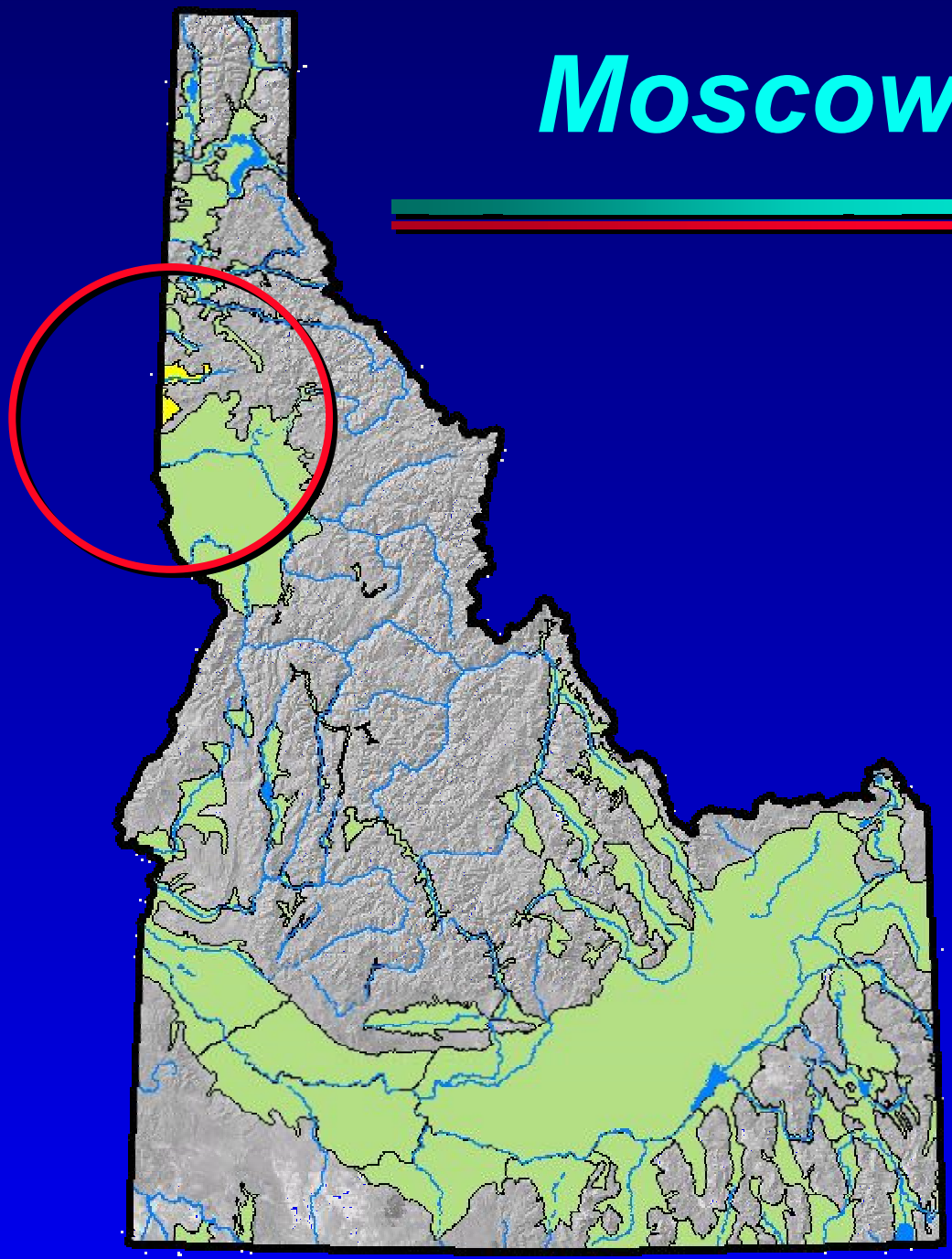
Cumulative Departures From Annual Precipitation Coeur d'Alene and Bayview, Idaho



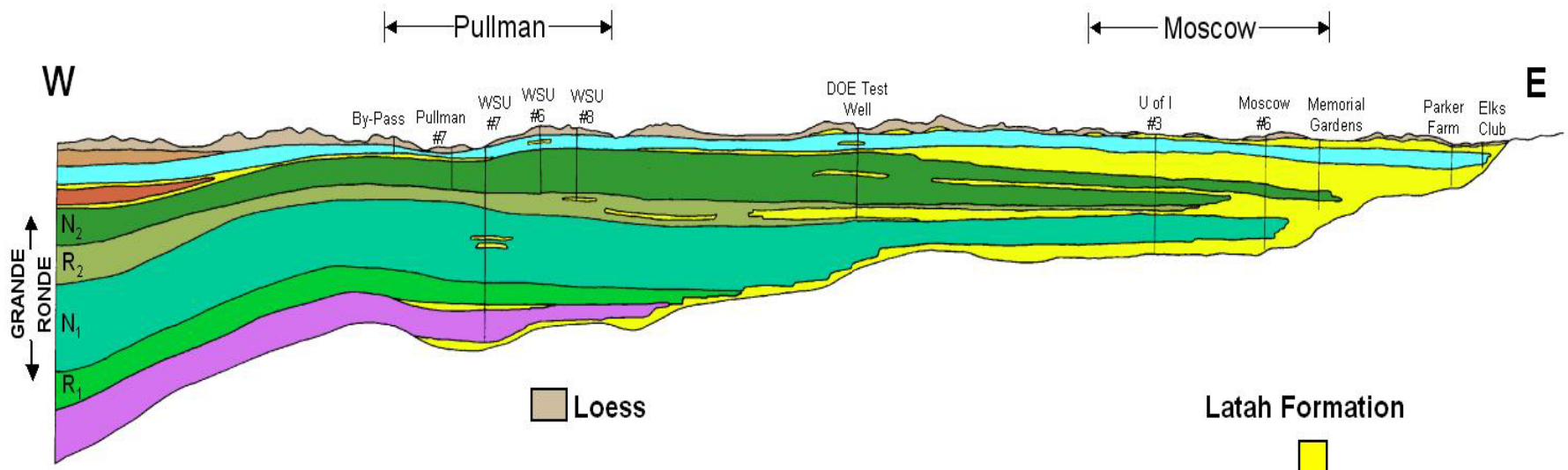
Synopsis of Current Understanding

- Dominant factor affecting ground water levels in Idaho is amount of annual precipitation.
- There is no hydraulic connection between the aquifer and surface water in Idaho.
- Ground water withdrawals from the aquifer in Idaho are poorly documented.
- Ground water levels in 2002 were largely unchanged from 1934, 1948, 1954, 1975, and 1985.
- Aquifer connects and discharges to Spokane and Little Spokane Rivers in Washington.
- Ground water withdrawals in Idaho may affect designated instream flows in Washington.

Moscow - Pullman



Cross-Section of Moscow – Pullman Aquifer System



Loess

Latah Formation

Columbia River Basalt Group

Saddle Mountains Formation

Wanapum Formation

- Priest Rapids Member
- Roza Member

Grande Ronde Formation

- N_2 magnetostratigraphic unit
- R_2 magnetostratigraphic unit
- N_1 magnetostratigraphic unit
- R_1 magnetostratigraphic unit

Imnaha Formation

0 1 Mile

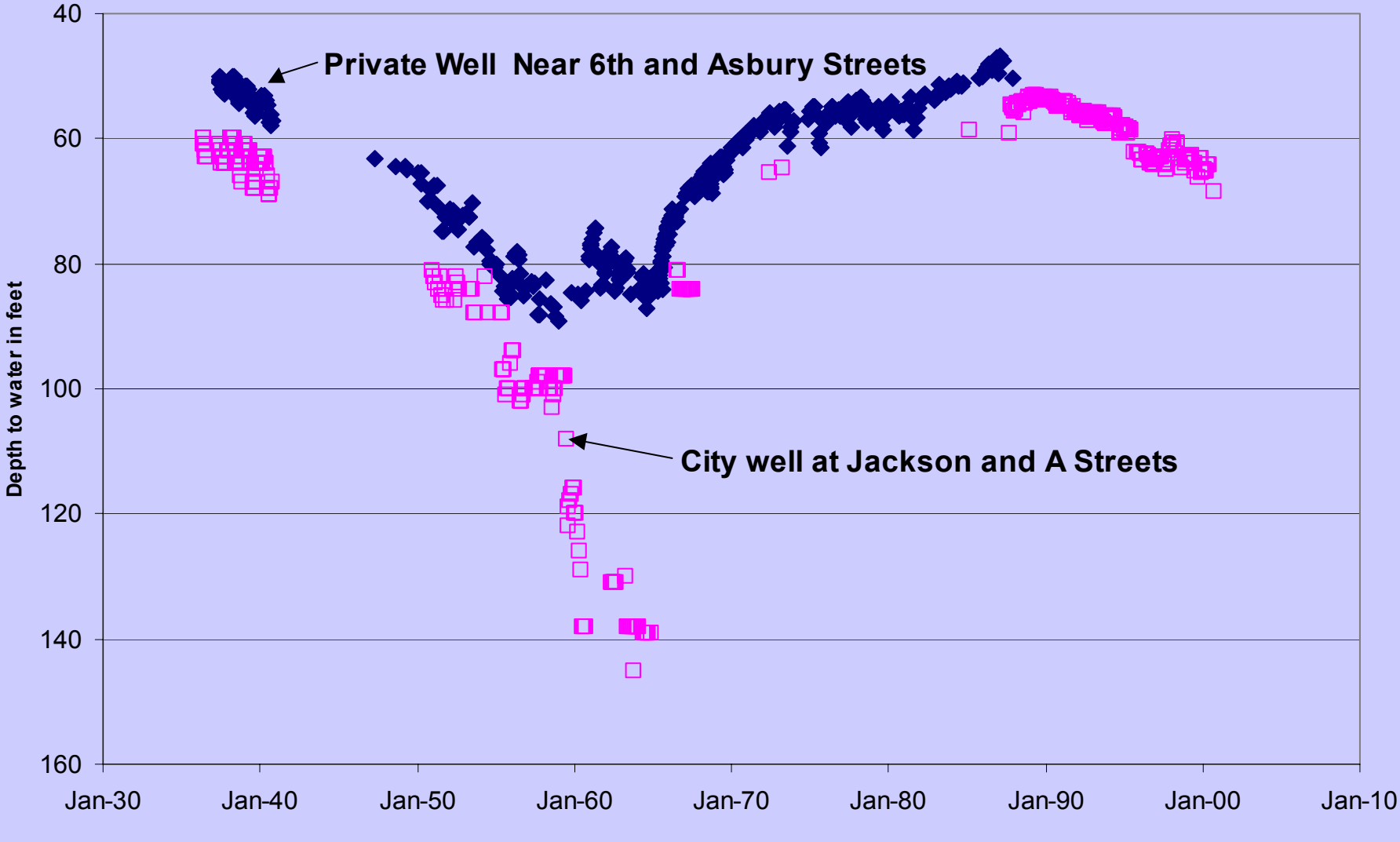
Vertical Exaggeration ~4x

John H. Bush and Dean L. Garwood, 2004

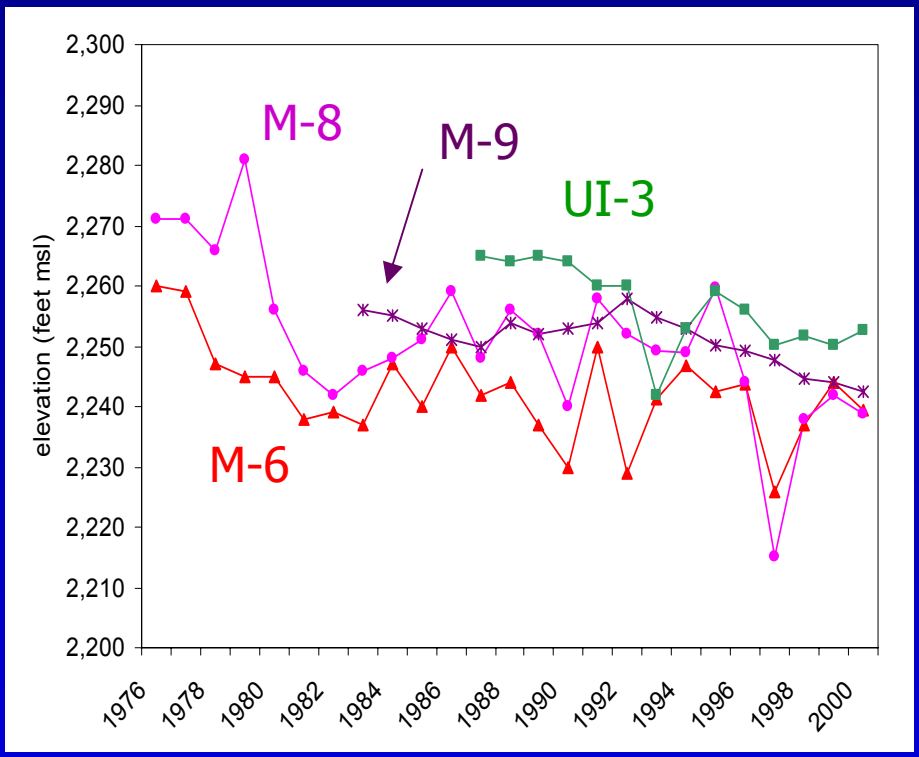
Use of Upper Wanapum Aquifer

- **Wanapum (upper) aquifer declined under Moscow until 1960s, when deep wells were drilled into Grande Ronde (lower) aquifer.**
- **Moscow now withdraws 30± percent of its water supply from the Wanapum.**
- **Water levels have now recovered to 1940s levels.**

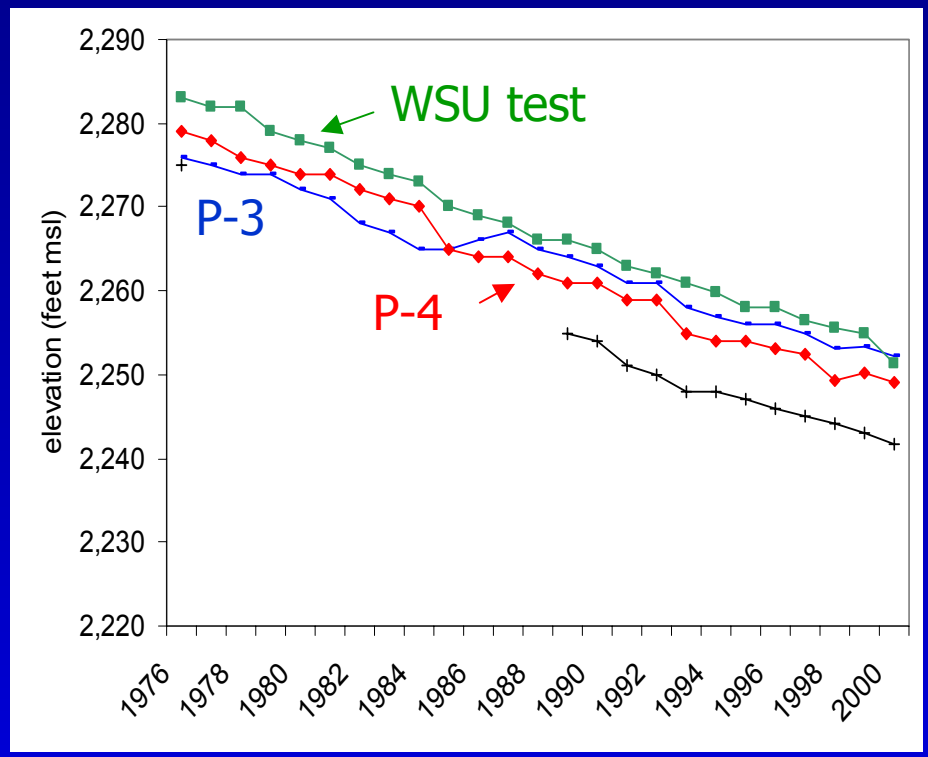
Use of Upper Wanapum Aquifer (Hydrographs from two Moscow Wells)



Use of Lower Grande Ronde Aquifer (Hydrographs from Moscow & Pullman Wells)



Moscow Wells

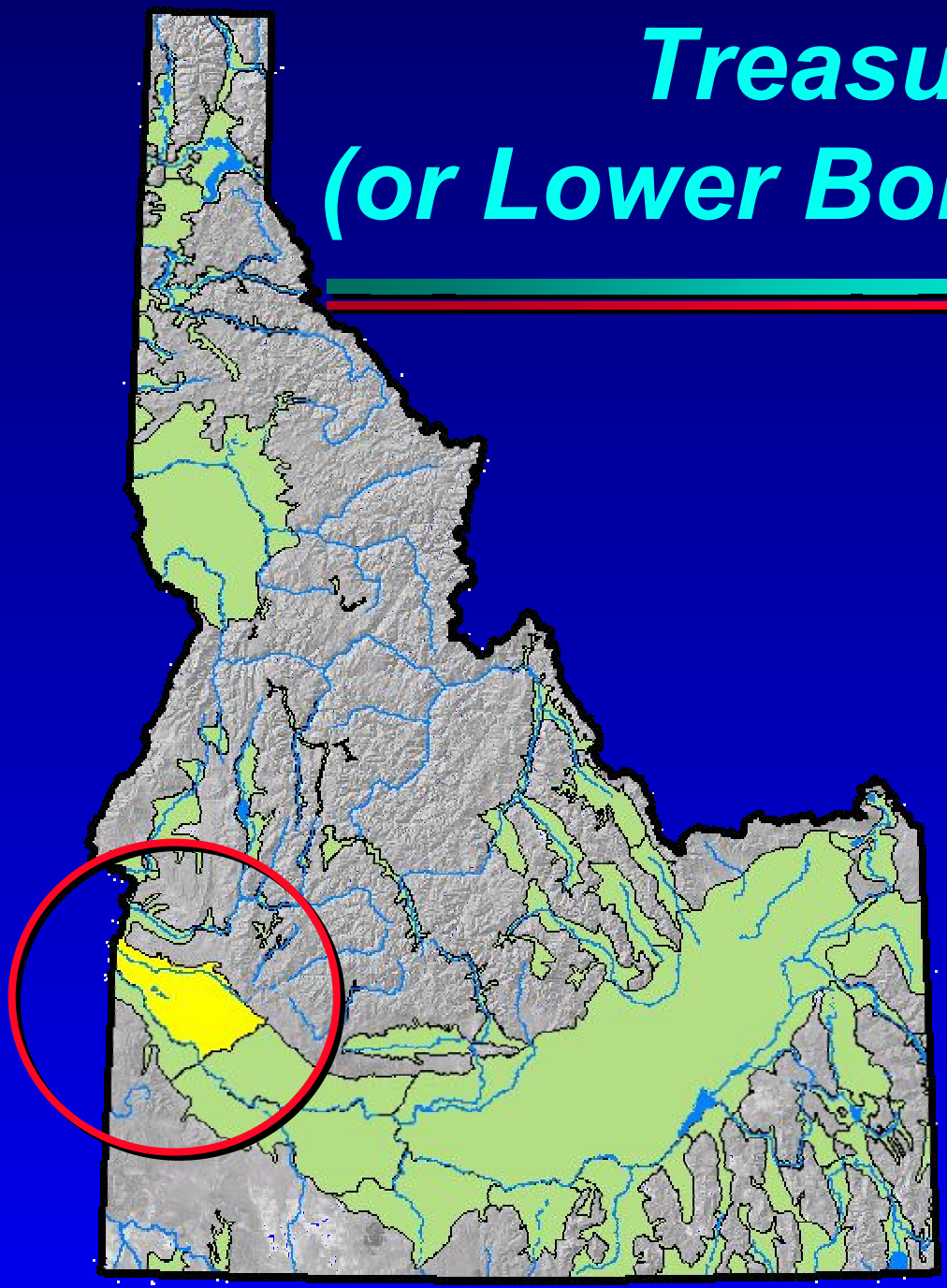


Pullman Wells

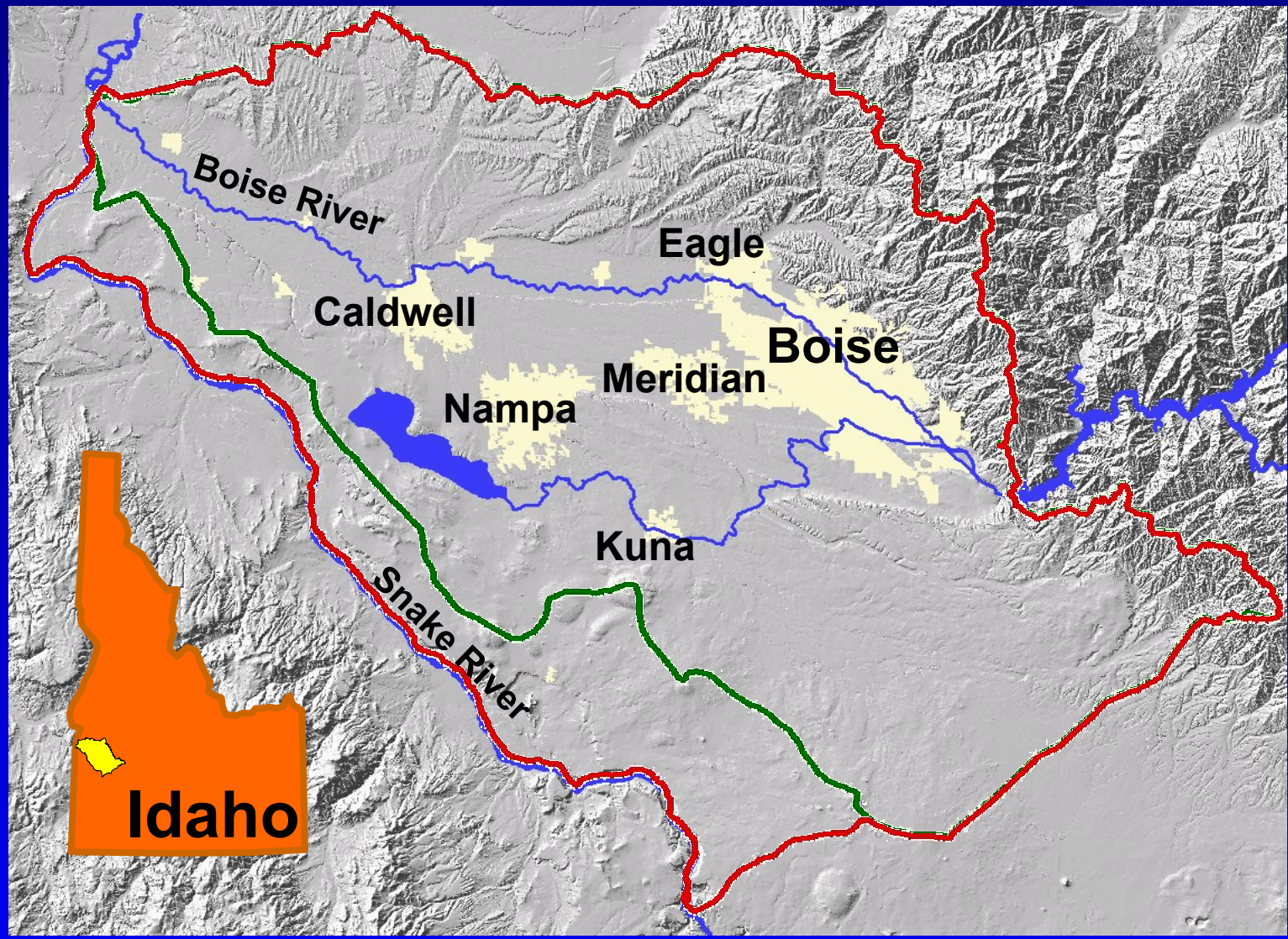
Synopsis of Current Understanding

- Recharge to Wanapum (upper) aquifer is from precipitation and stream losses
- Recharge to Grand Ronde (lower) aquifer is primarily from downward leakage from Wanapum.
- Recharge to Wanapum is greater than to Grande Ronde, but estimates have large error band.
- Ground water withdrawals from Grande Ronde has stabilized and water levels may be approaching stable, though lower, levels.
- Interstate Palouse Basin Aquifer Committee (PBAC) formed in 1990s, developed management plan, and continues to function.

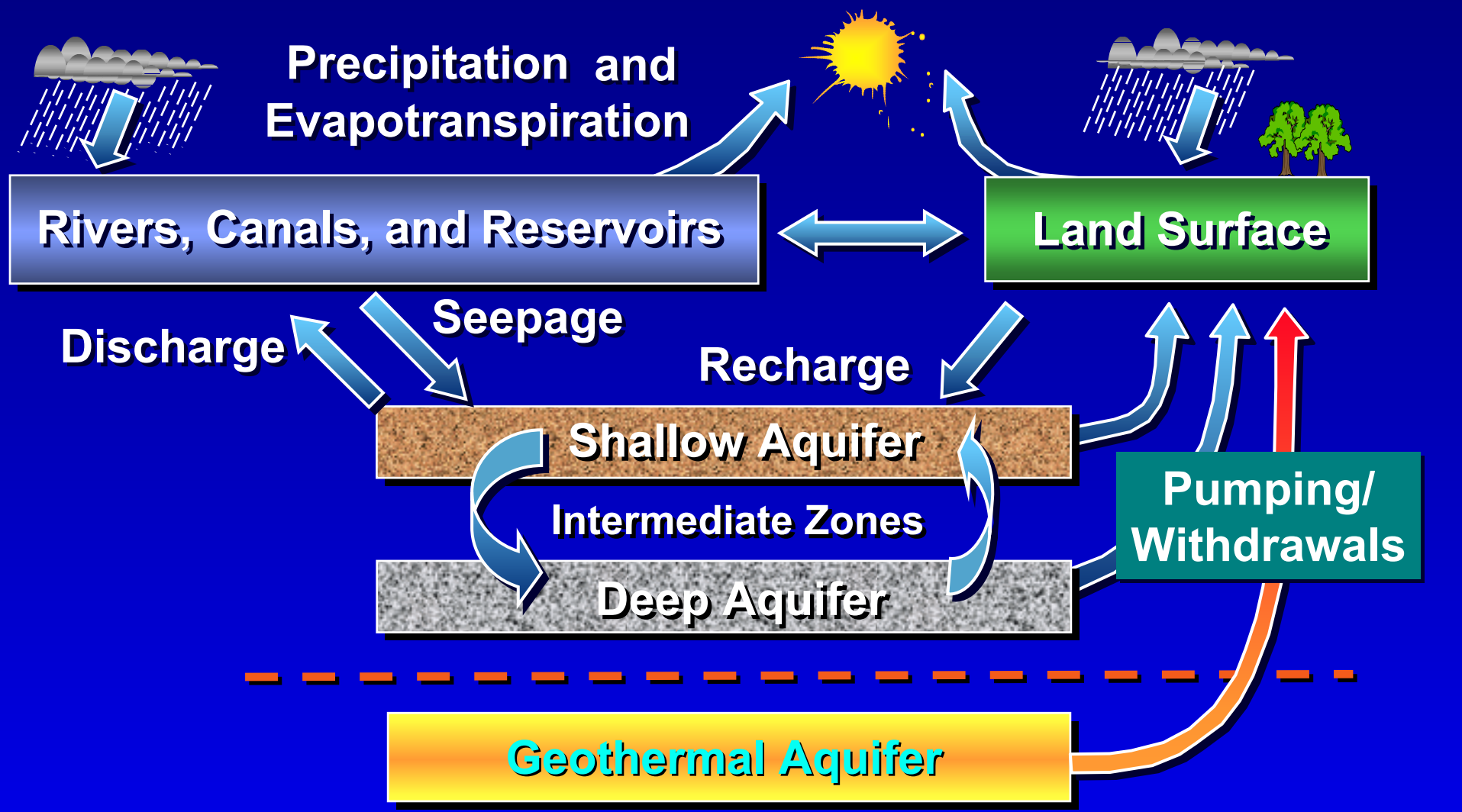
Treasure Valley (or Lower Boise River Basin)



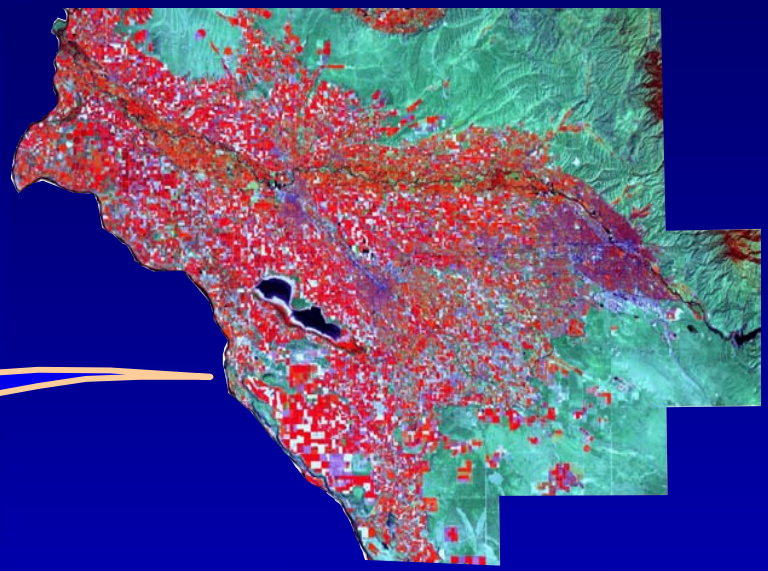
The Treasure Valley Aquifer

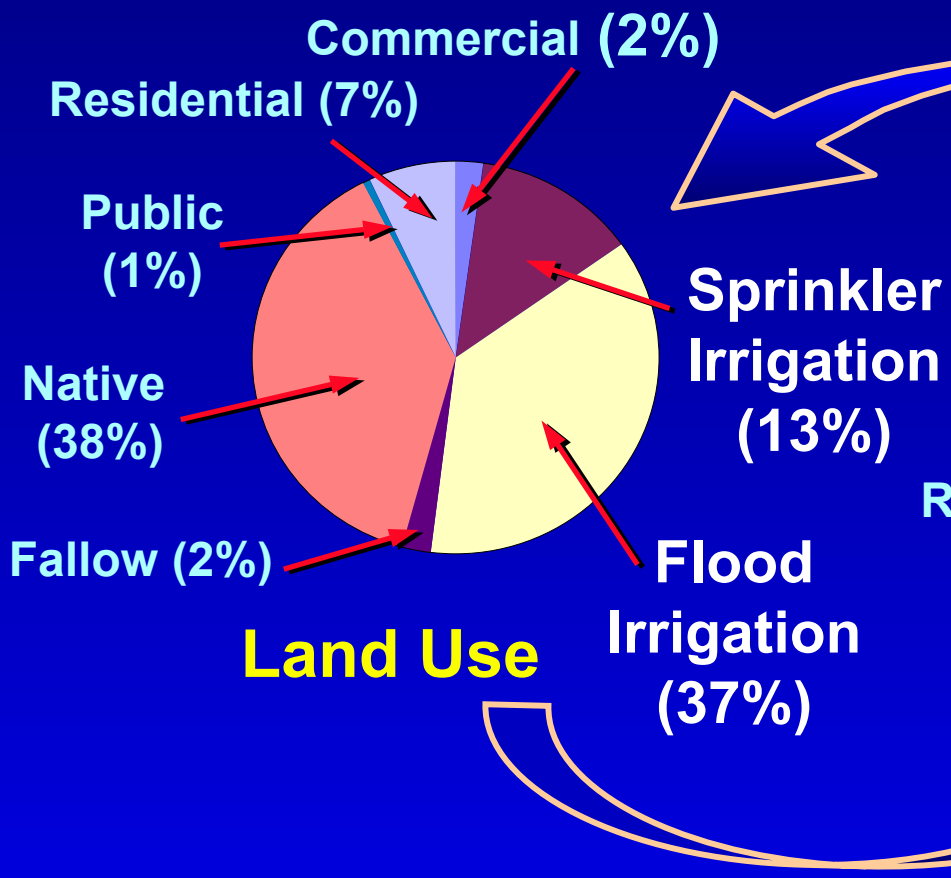


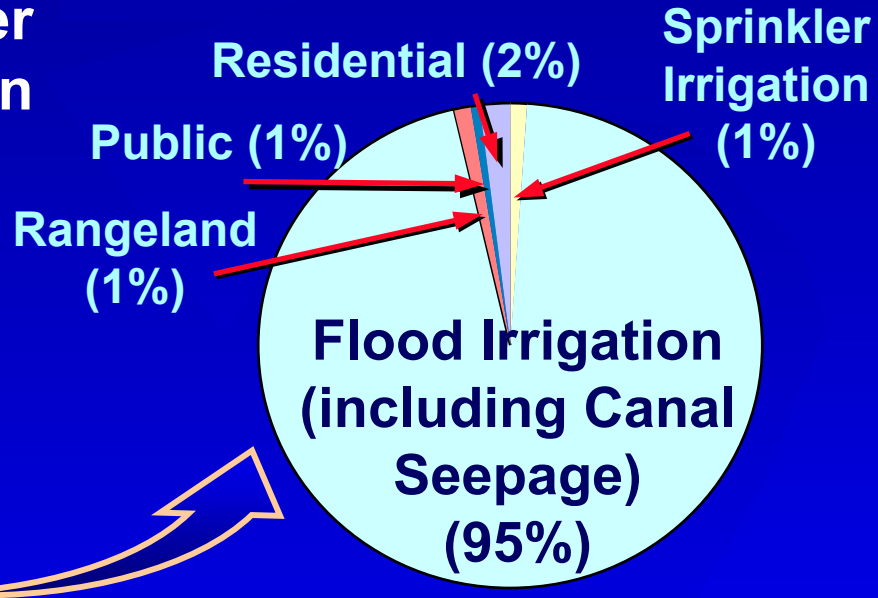
Treasure Valley Hydrology



Ground Water Recharge

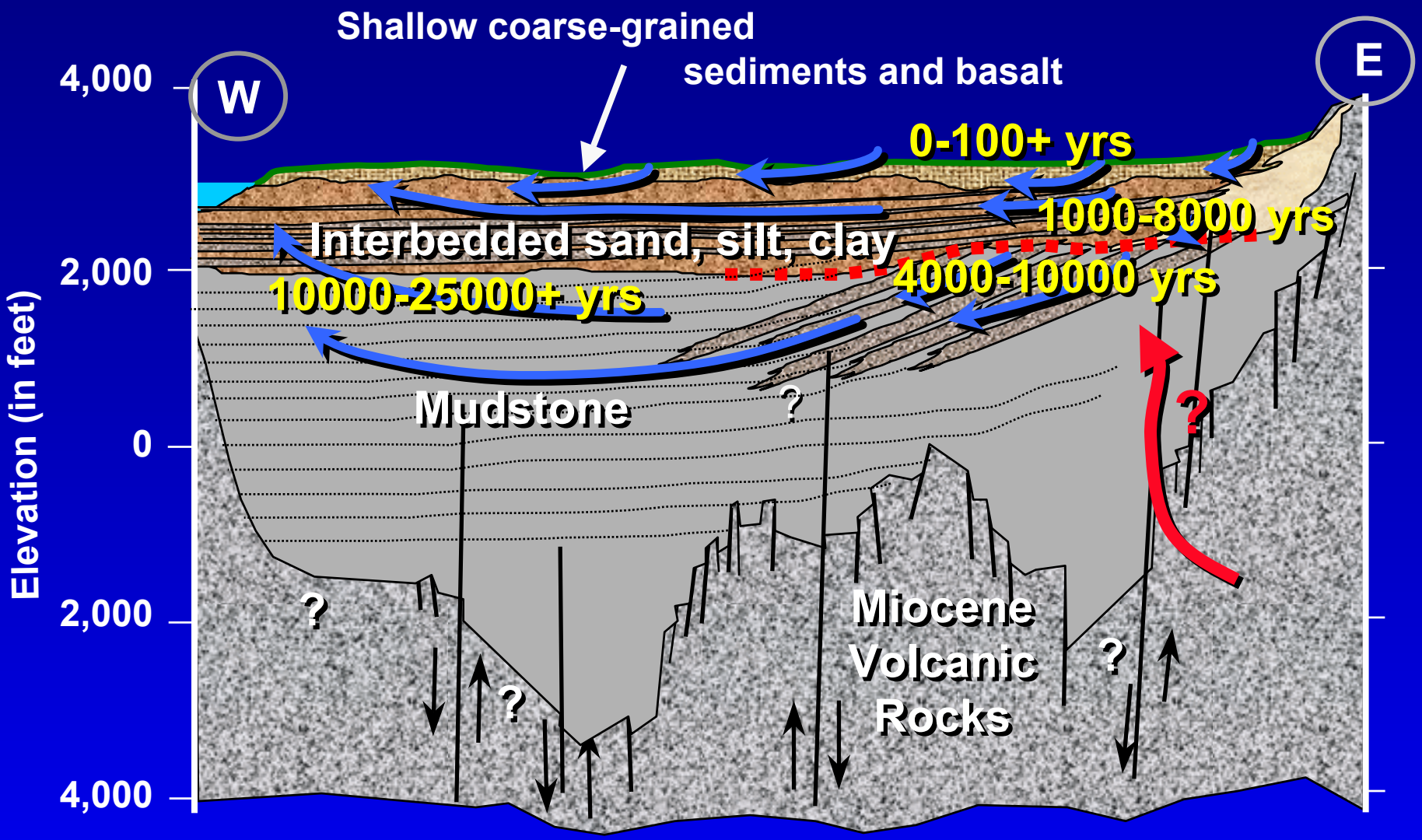




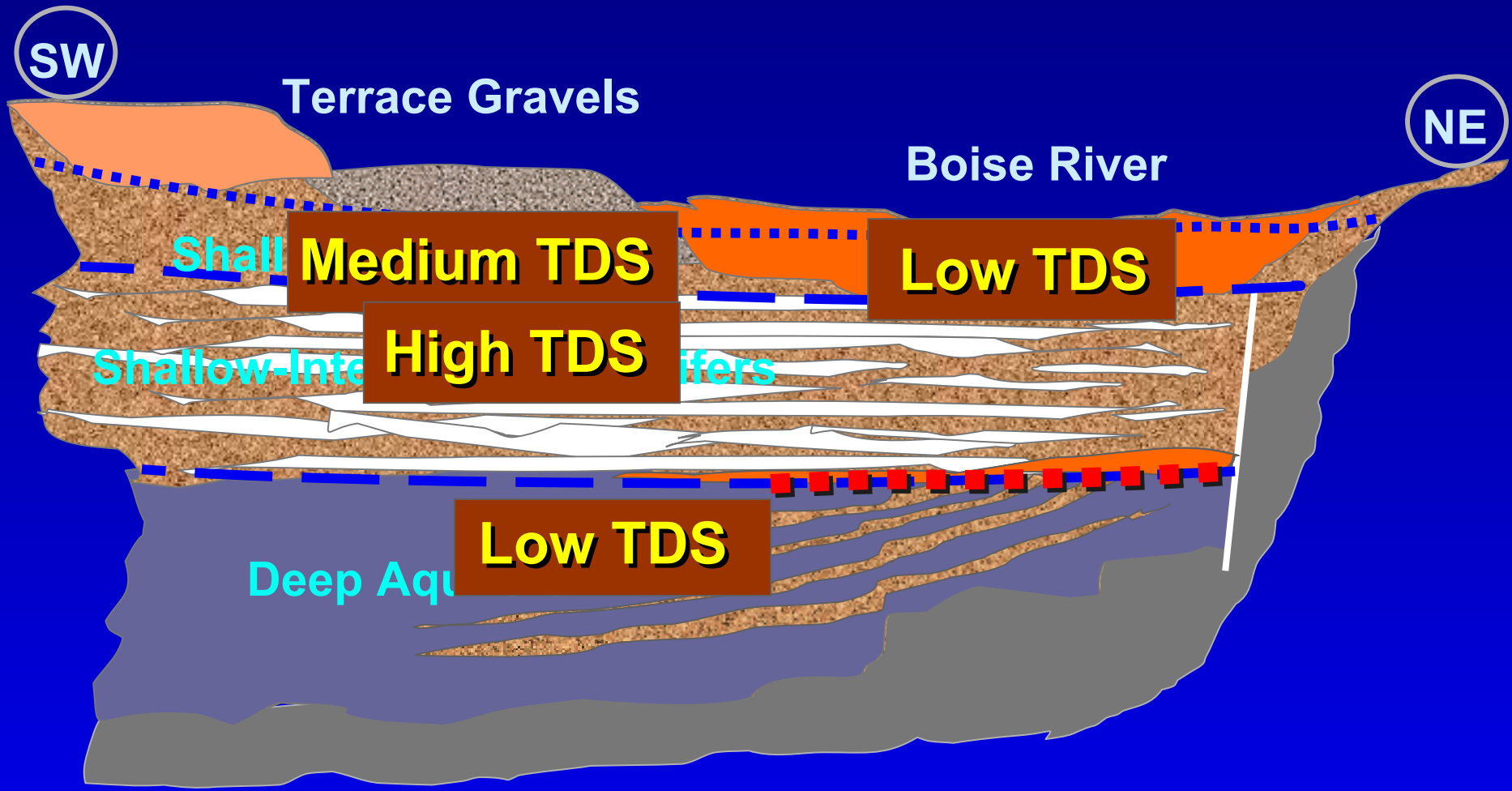


Estimated Recharge to Shallow Aquifers

Regional Ground Water Flow System

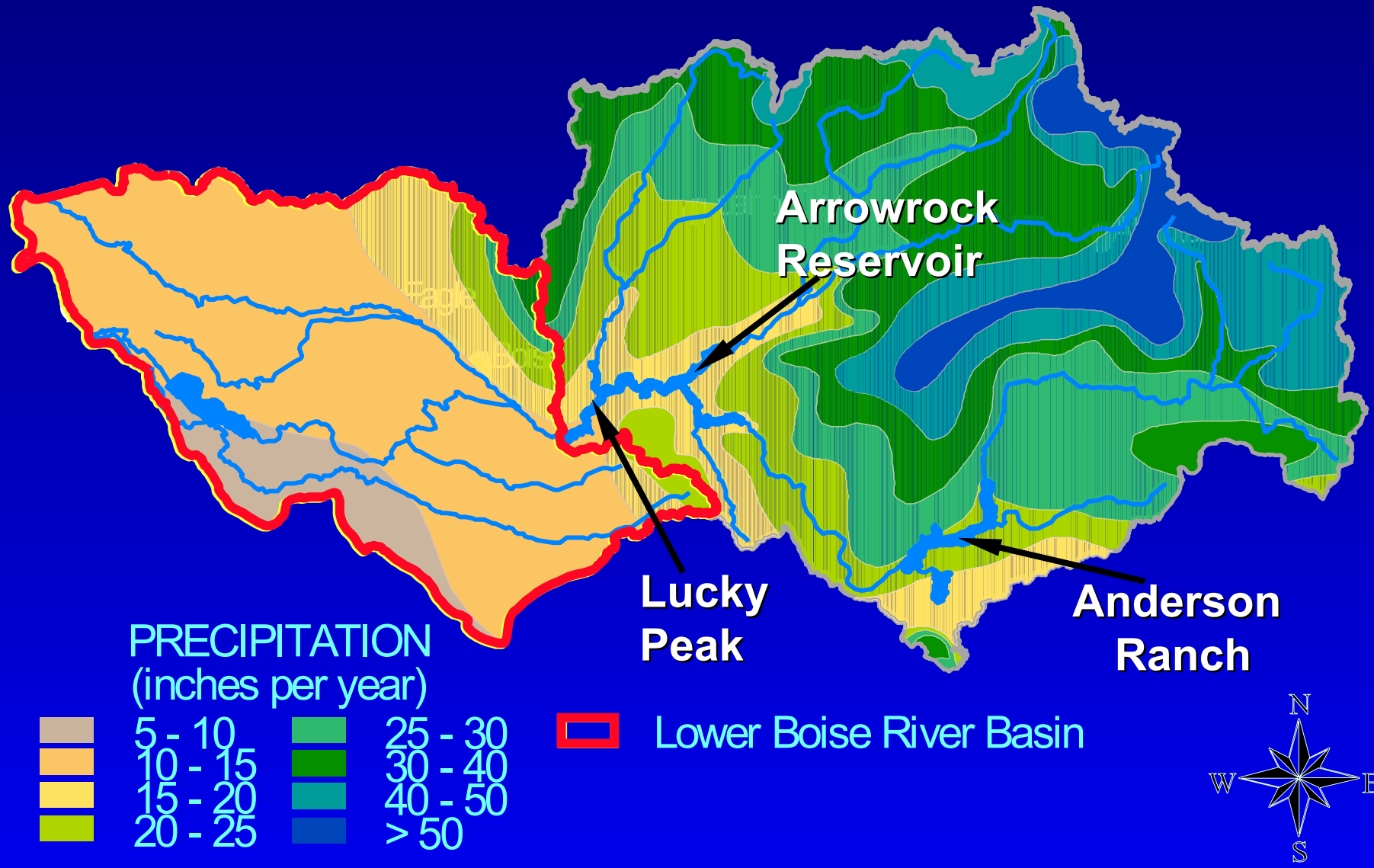


Vertical Extent of Ground Water – Surface Water Interaction



(Conceptual Model)

Boise River Watershed Precipitation

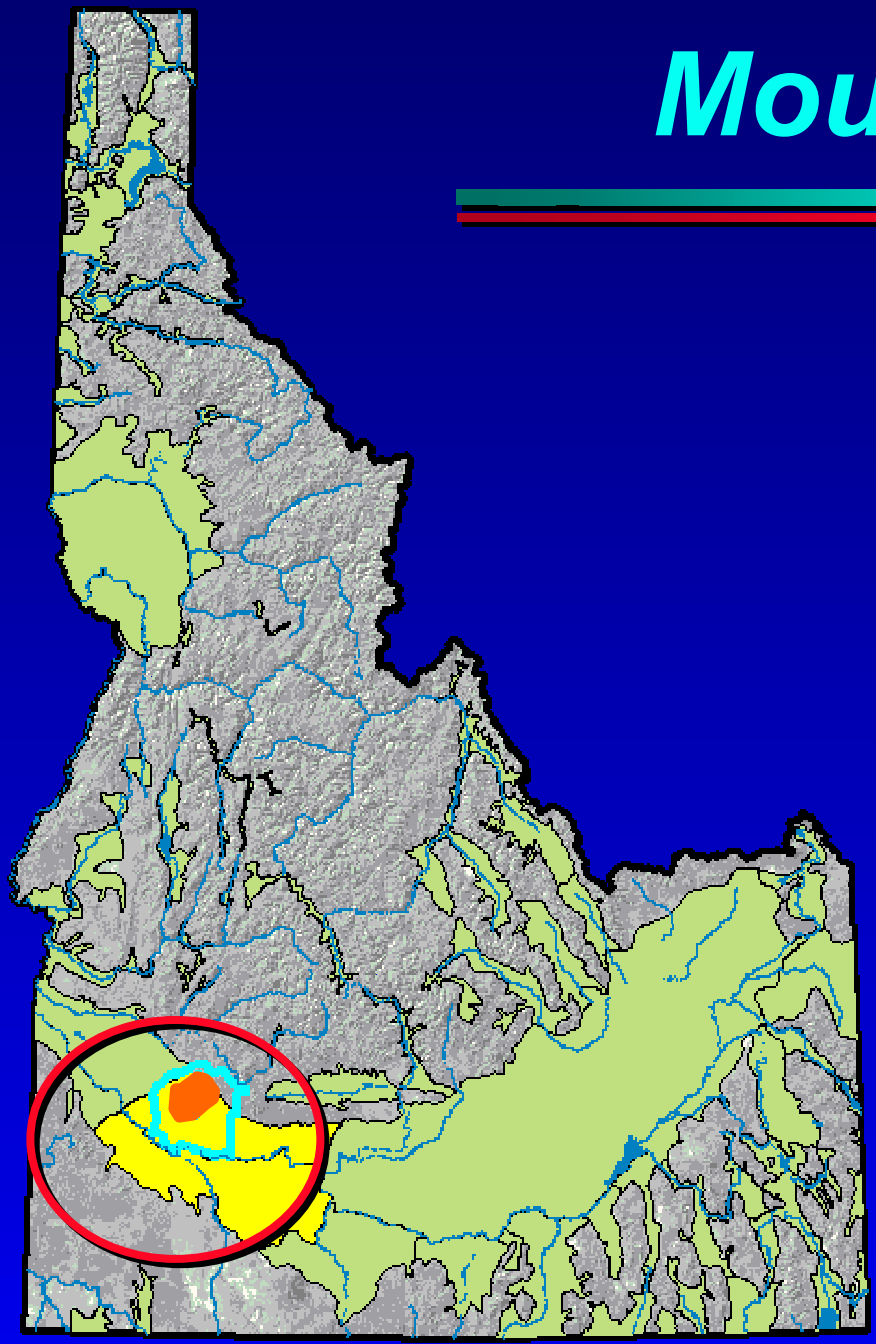


Irrigation / Land Use (1937-1994)

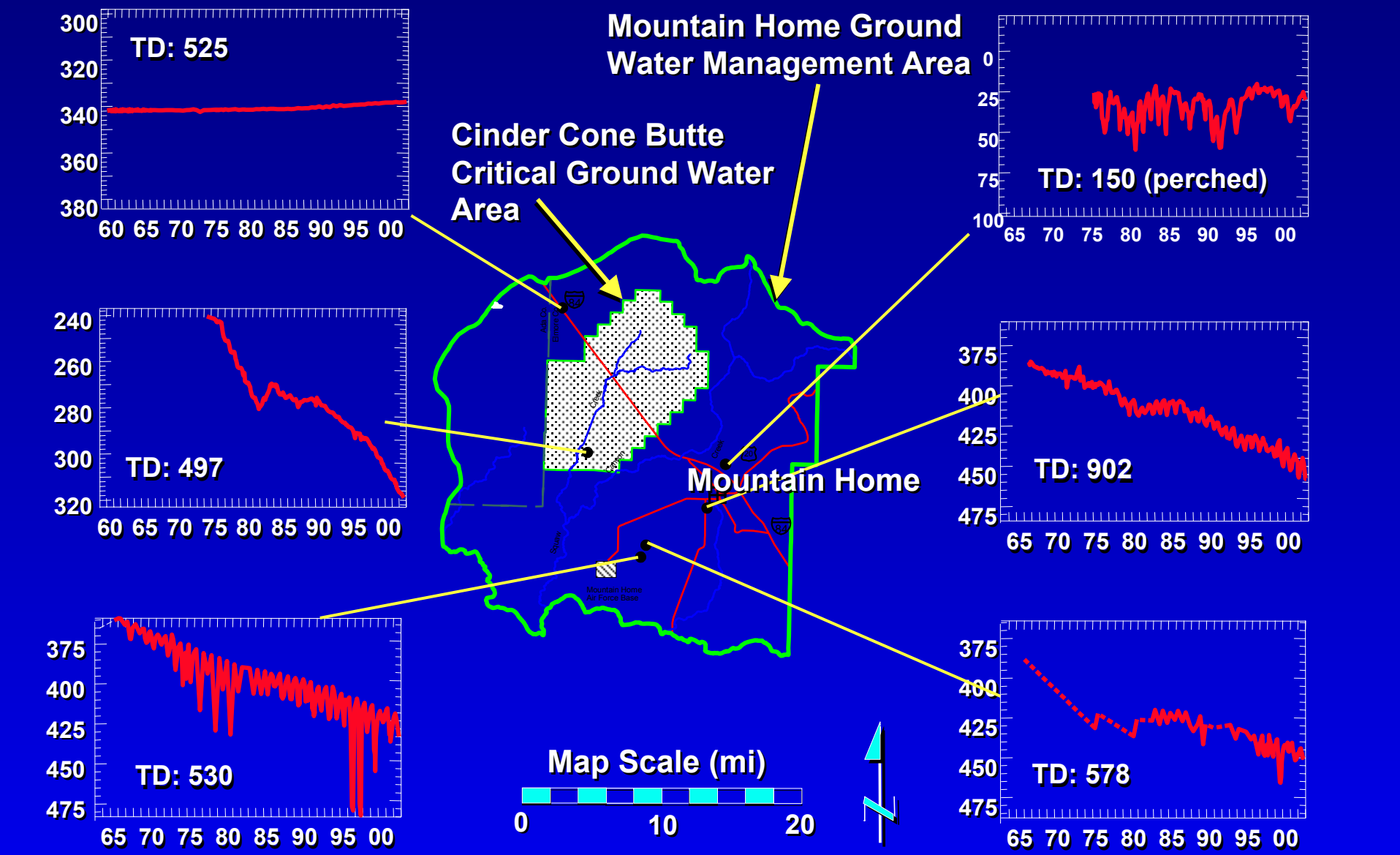
Synopsis of Current Understanding

- Ground water withdrawals impact availability of water in surface water sources.
- Significant declines in water levels have occurred in Southeast Boise and South of Lake Lowell.
- Moderate declines, generally less than 10 feet, have occurred between Eagle, Kuna, and West Boise.
- Model simulations show potential for additional declines with additional withdrawals.
- Approximately 1,000,000 acre feet discharges annually from western portion of aquifer to surface water sources below City of Star.
- Water in eastern and central portions of valley not available when needed, which could be addressed with additional storage, including “aquifer storage and recovery.”

Mountain Home



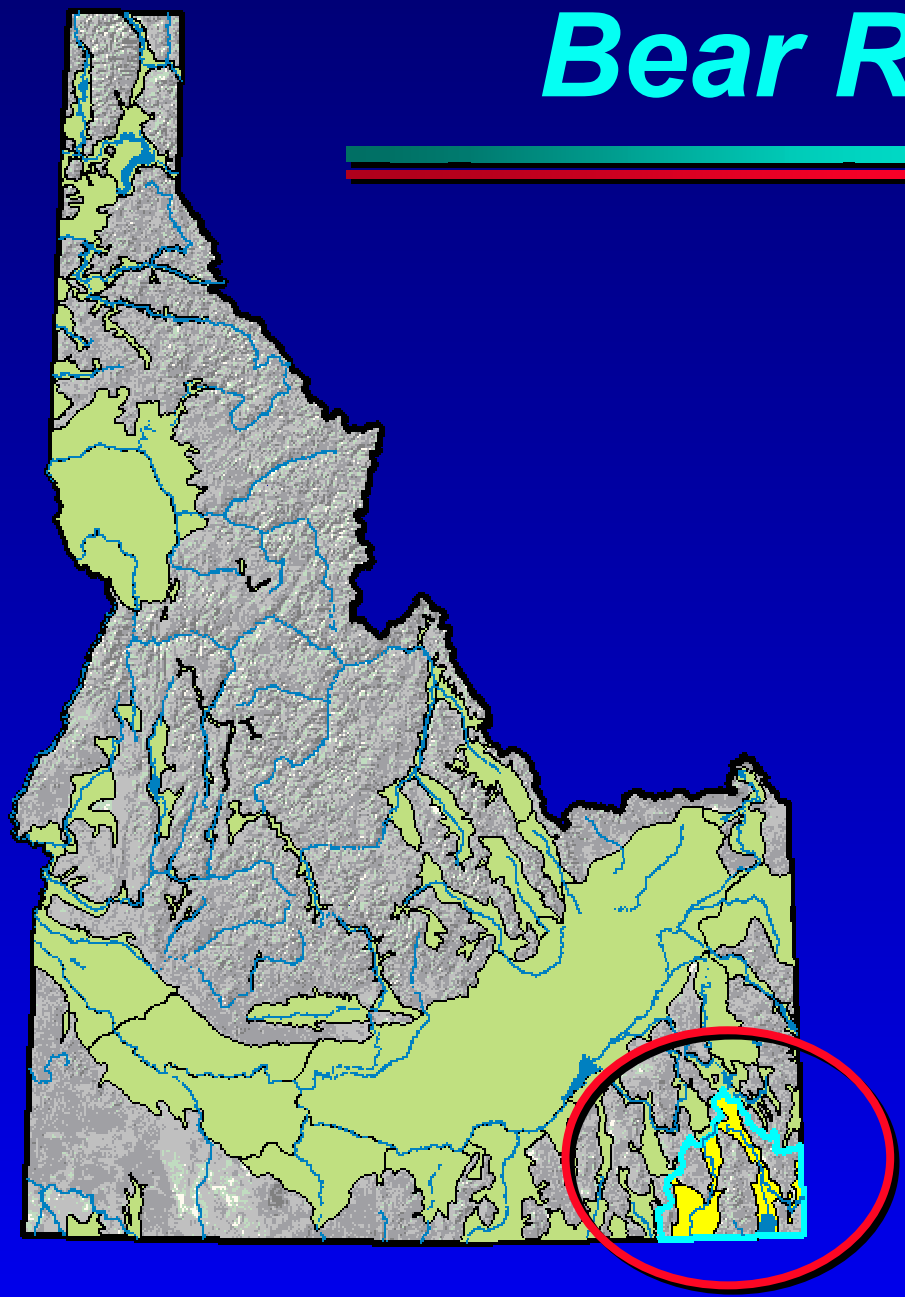
Mountain Home Aquifer System



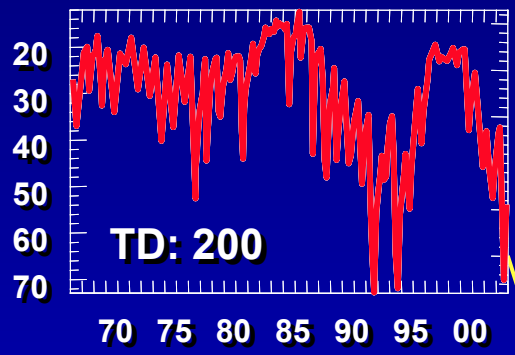
Synopsis of Current Understanding

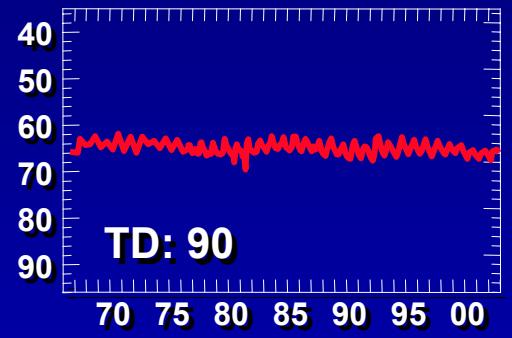
- Two aquifers comprise system: shallow, perched aquifer; and deeper, regional aquifer.
- Have limited knowledge of geological features that control ground water characteristics, such as faulting.
- Ground water level declines more severe the farther away from recharge area near foothills.
- Water use exceeds average annual recharge by approximately 30,000 acre feet per year.
- Limited surface water available for recharge.

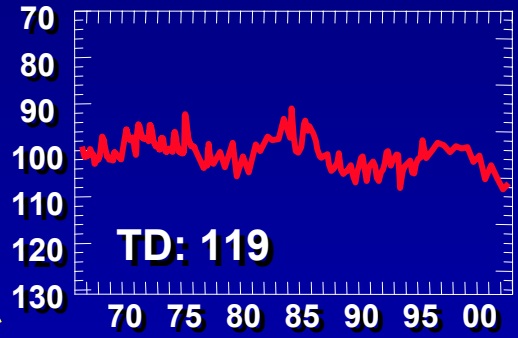
Bear River Basin

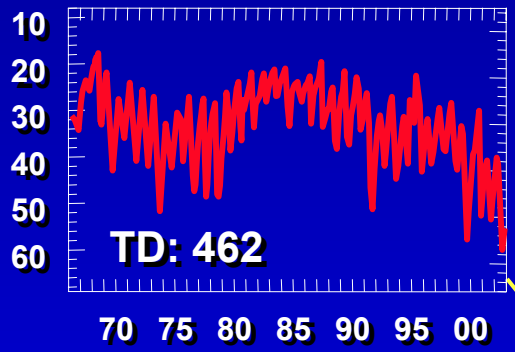


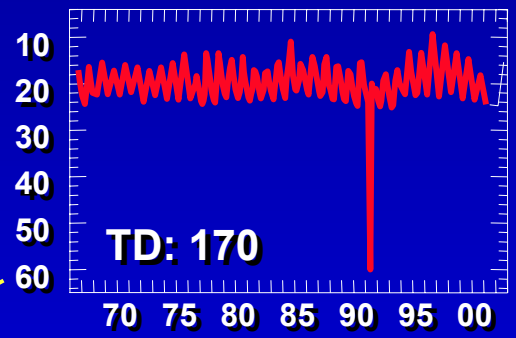
Bear River Basin

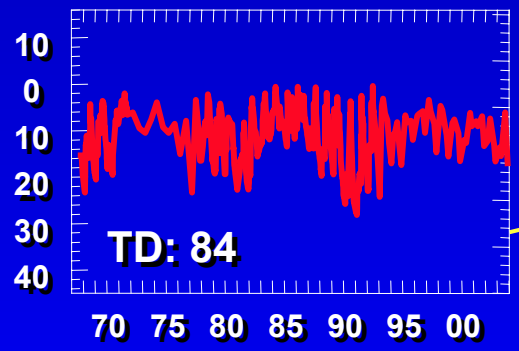


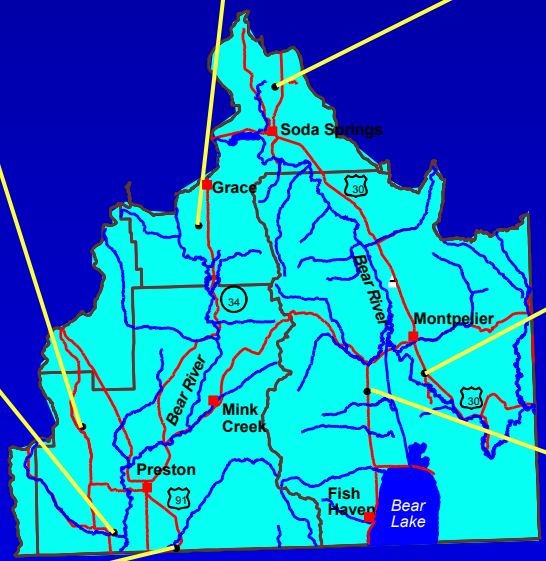


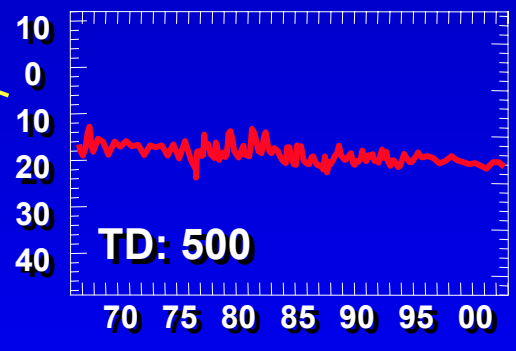




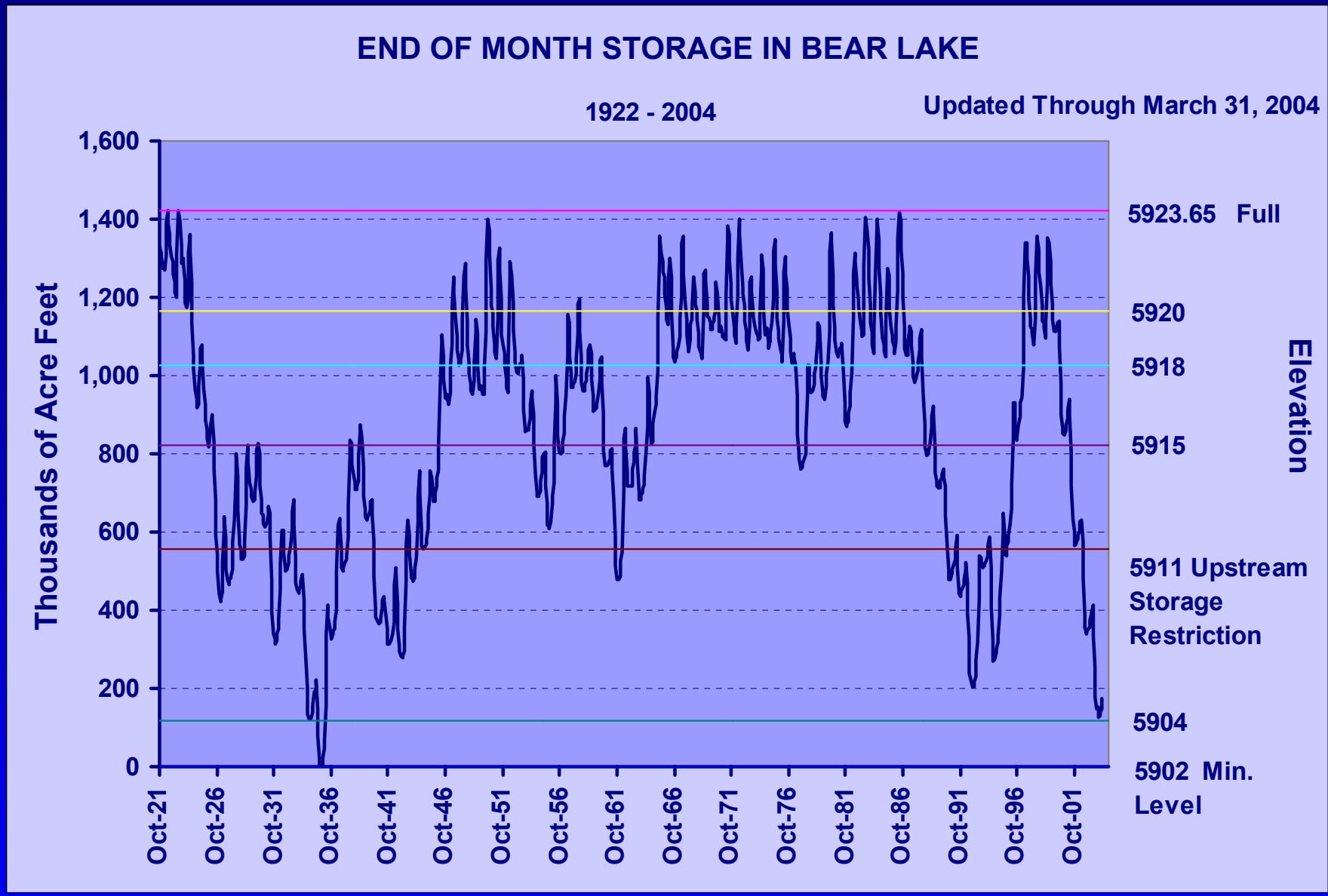








Bear Lake Storage for Irrigation



Synopsis of Current Understanding

- System comprised of multiple aquifers, consisting primarily of valley sediments.
- Ground water withdrawals cause depletions in surface water sources.
- Surface water supplies in 2004 will be extremely limited, and releases from Bear Lake will probably not be sufficient to supplement full irrigation needs.
- This will probably result in curtailment of surface water diversions in Idaho in 2004, and possibly in future years.


Additional
Questions ?